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EDUCATIONAL OPINION

GENERAL NOTES.

THERE is no close time for the educationist, who now invades even the month at one time sacred to the open air and to that forgetfulness of school and scholars which served as the motive power for strenuous and effective work during the rest of the year. While I write, in an old farmhouse garden not far from "fair Melrose," the Educational Section of the British Association is conferring at Leicester, and the International Hygiene Congress is creating new means of bringing on nervous disorders. Is there any other trade or profession which is so much a subject of talk? Sir Philip Magnus at Leicester re-echoes Professor Sadler's cry for "more experiment." One would have thought that there was already too much pulling up of the plant to see how the roots were taking hold of the soil.

Examining the Roots.

WE are not disposed to find fault with the non-revolutionary character of the new Primary Code. The large class still remains; but that is a financial matter over which the Board of Education is not the sole, or even the chief, controlling power. The unqualified teacher is also given a new lease of life; but that too is largely a matter of money, for while the prospects of the profession remain as they are, the qualifications are not greatly worth seeking. The reintroduction of the punishment-book is, in our opinion, a superfluity of naughtiness, and a direct incentive to that scorn of official regulations which is apt to make the wisest and most beneficent of rules become a dead letter. The change from "Physical Exercises" to "Hygiene and Physical Training" is a proof of the activity of the exponents of the new nervousness. We have made it our business to watch the actual instruction in the principles of health-preservation in a number of schools, and we are not greatly enamoured of the new "subject." If some of the amiable theorists who talk so glibly of "hygiene and temperance" were condemned to a twelvemonth's practical exposition of their principles in schools of the ordinary primary type, their conferences would be afterwards well worth attending for several reasons.

The New Code.

WITH three of the so-called "minor changes" in the Code we are in very cordial agreement. These are the additions to Articles 2 (1) and 2 (4) respectively, and the alteration of Article 2 (10). The first relates to English Language teaching, and runs: "In the higher classes silent reading should be the rule rather than the exception, and the scheme of instruction should include a wide course of reading under suitable guidance, with the aim of creating a capacity for systematic study and a taste for good literature." The second is as follows: "Drawing, including drawing from actual objects, memory drawing, brush drawing, *and the use of ruler and compass, which may lead up to exercises in practical geometry* and *the drawing of objects to scale.*"

Educational Changes.

The third change is denoted in the following by the use of italics: "*Domestic subjects* (for girls only), *including the proper performance of ordinary domestic duties, and in all cases such forms of needlework as* knitting, plain sewing, darning, and, in the higher classes, mending and cutting out. *In teaching needlework special care should be taken to avoid all conditions unfavourable to eyesight.* The oldest girls should be given a practical training in cookery, laundry work, and housewifery, *except where circumstances render this impossible.*"

THE London *Tribune* announces that "next year the President of the Board of Education is to introduce the Government's second Education Bill. The first Bill, introduced by Mr. Birrell, was a compromise which was destroyed by Mr. Balfour for party purposes. It would have been impossible for the leader of the Opposition to have accomplished this object had not the Bill been so weakened by compromise that in seeking to please all it satisfied none. Next year, we are told, we are to have a Bill which will carry out Liberal principles, *without any consideration of, or regard for, sectarian claims.* The Bill, it is said, must provide that in the future every public Elementary School must be subject to two great principles, namely:—

1. Complete popular control; and
2. No sectarian tests or restraints for either teacher or child.

To carry out these principles, a single and uniform class of school must exist throughout the country. All schools must become council schools, subject to similar control, similar administration, similar freedom from all sectarianism."

Next Year's Bill.

THE "main principles" of this new attempt at a settlement of the vexed question are given by the *Tribune's* Parliamentary correspondent. They are as follows:—

Main Principles.

"1. In every district there must be within the reach of every child a public Elementary School which the children of all denominations may attend without suffering any religious disability.

"2. Every public Elementary School must open and close with some form of religious service (consisting of a hymn, the Lord's Prayer, and the reading of a passage of Scripture without comment), in which all children may take part without objection on religious grounds.

"3. In *every* public Elementary School there must be opportunities for *every* child to receive such *special* religious instruction as its parents may desire. Such instruction must not be given during school hours, must not be given at the public expense, or by the publicly-appointed teacher. The arrangements as to the time and place when such instruction shall be given shall (subject to certain restrictions) be controlled by the Local Education Authority.

"4. No publicly-appointed teacher shall be permitted to give special religious instruction.

"5. Any school now recognised as a non-provided school may be carried on as an Elementary School recognised by the Board of Education (but not by the Local Education Authority) in which it is shown to the satisfaction of the Board of Education that the parents of two-thirds of the children attending that school

desire that it shall be so carried on. But no parent shall be compelled to send his child to such a school."

We trust that all concerned will be truly thankful for this attempt at a settlement.

* * *

Secondary Schools (Board of Education).

THE comparative smallness of the "secondary" work done by the Board of Education may be judged from the following interesting figures taken from an official White Paper recently issued :—

The 600 State-aided Secondary Schools dealt with in this paper may be divided into—

(*a*)	157 Schools provided by Local Education Authorities, educating.....	33,183	scholars
(*b*)	19 "Municipalised" Endowed Schools, educating.	4,610	,,
(*c*)	335 ordinary Endowed Schools, educating	52,643	,,
(*d*)	89 "other" Schools, namely :—		
	i. 32 Schools of the Girls' Public Day School Trust, educating.....	6,842	scholars
	ii. 42 Roman Catholic Schools, educating...	5,880	,,
	iii. 15 Miscellaneous Schools, educating...	1,780	,,
		14,502	,,
Total	600	104,938	

If pupil teachers are included, these Schools are educating 114,218 scholars.

These are the pupils affected by the newest Regulations just issued, which have created some stir in several quarters.

* * *

The New Regulations.

ON the whole, the new Regulations for Secondary Schools will at least be welcomed by those responsible for the internal organisation of these institutions. Numerous harassing restrictions are removed. Greater liberty will be given to a school in framing its curriculum, and educational experiment is directly encouraged. The old grants with their variations disappear, and the new uniform grant of £5 per head will be paid for the full six years of the normal—or what ought to be the normal—Secondary School career. But in return for all this, twenty-five per cent. of the school places must be offered free to pupils who have for two years immediately preceding been in attendance at public Elementary Schools. Over this there will be much searching of heart, and many discussions as to whether the higher Board of Education grants can be dispensed with; for a school which does not accept the new conditions can, for the present year at all events, refuse to do so to the tune of a 50s. reduction in the grant per head. An examination is to be held by the governing body, but the subjects are to be limited to English and arithmetic; and the teachers of the contributory Primary Schools are to be asked to make reports upon the general fitness of the candidates for taking full advantage of the Secondary School. The whole scheme is tentative and fairly elastic, but there is no doubt of the ultimate far-reaching effect upon English higher education. The future is to the "poor scholar."

* * *

The Teachers' Charter.

THIS is the title which has been already earned by the newest Training College Regulations in at least one educational camp, while the other side characterises the new rules as "oppressive and predatory." The Church party says in effect: "The colleges are ours; they have been built with the money of Churchmen for a definite denominational purpose; and the governing body of each has a right to decide upon the constituents of the religious atmosphere." The reply to this appears to be: "The Church does not really care for the matter to the extent of contributing more than a comparatively trifling amount towards the upkeep of these institutions, which are for the most part maintained by public funds. Therefore the public has the right to claim admission for those who cannot conform to Church doctrine and practice." It is a quarrel unworthy of a great and wealthy nation; for the way out is obvious—the establishment of independent State colleges wherever they are needed.

N.U.T. NOTES.

A Great Scheme—

THE "forward" policy of the National Union of Teachers, particularly with regard to salaries and reasonable conditions of service, has, not unnaturally perhaps, aroused hostility in the minds of many already jealous of the Union's power and influence, who have not hesitated to dub the N.U.T. as a "trades union" of the most aggressive and pronounced type. Personally, I do not mind this in the least. Yet I venture to recall the circumstance that the purely educational work of the Union, designed solely for the benefit of the children in the nation's schools, absorbs by far the largest amount of the Executive's energy and ability, *and always has done!* For a generation the Union has worked practically single-handed, and often as one crying in the wilderness, in the direction of forcing upon the attention of obscurantist education authorities, and—I grieve to write it—a strangely lethargic and apathetic Board of Education, the urgent need for properly-qualified teachers, more especially in the primary schools. After over thirty years of compulsory education, it is nothing short of a scandal and national disgrace that even to-day *less than half* of the so-called "teachers" actually employed possess the certificate of the Board of Education—the Departmental hall-mark of efficiency and capacity; and I am tempted to wonder how much longer intelligent fathers and mothers, who are content to make so many sacrifices in order that their children may be properly equipped for life and livelihood, will tolerate this disgraceful state of affairs. Public meetings *may*, perhaps, do some little good here and there, but frequent representations, both to the Board of Education and its successive presidents, seem absolutely futile. Indeed, I am rapidly coming to the conclusion that nothing less than a Minister sprung from the people—the "Labour Party," if my readers prefer the term—who still remembers his own early disadvantages, will effect any real reform, and break down the *laissez faire* bureaucracy that, whichever political party be in power, is allowed to dominate the purlieus of Whitehall.

During my thirteen years' service on the Executive I have witnessed the preparation and promulgation of many "schemes," but I cannot call to mind one better or more complete in every detail than that submitted by the special committee on "The Training of Teachers," which, during its half-dozen sessions, had the advantage of the presence and wise counsel of Mr. Alfred L. Cann, B.A., the talented Principal of the Manchester Pupil-Teachers' College.

COMMENCING with the dictum that, as a rule, pupil-teacher candidates should have a period of secondary-school training, the scheme proceeds to condemn as unsound the policy of earmarking scholarships for intending pupil teachers—a policy which should not be adopted under any circumstances, permanent or temporary. There is little doubt that an abundance of candidates for the teaching profession can be easily secured if the service be made more attractive.

For Teachers' Training.

The apprenticeship stage should continue between the ages of sixteen and eighteen, whilst admission should depend on (*a*) report of personal fitness from head teachers of the secondary school in which the candidate was taught; (*b*) probation for, say, three months in an approved school for the purpose of testing aptitude for teaching, and a satisfactory report from head teacher of the school in which this period is spent; (*c*) a guarantee that the pupil teacher will complete apprenticeship and collegiate course. Pupil teachers should be trained in specially-selected schools, regard being had to suitability of buildings, staff, etc., and they should have the opportunity of practice in various types of schools. Academic training should be given in a professional school, an institution training students for a definite career. In rural districts pupil teachers should attend at the centre (*a*) either Monday till Friday, with the following week at school; or (*b*) for a complete term, spending the week-end at home. It might possibly be desirable to lodge and board pupil teachers in a professional school for two academic terms each year, making the third term of each year a period of practical training.

There should be no break between the apprenticeship and collegiate courses; and every entrant to the profession should be trained in a training college or its equivalent for at least two years before certification. Professional training might be either concurrent or post-graduate, according to local circumstances, and the collegiate course should terminate with the granting of a diploma of high standard.

The paragraphs above incorporate the main features of the Executive's scheme; but amongst a number of "collateral recommendations" I find two of peculiar importance—(1) Ex-pupil teachers not proceeding to college should be recognised for a period of two years only, after which their recognition as teachers of any kind should automatically cease, unless they have qualified for entrance to college; (2) the cost of training teachers, other than that portion borne by the teachers themselves, should be a charge on the Imperial Exchequer, but at the various stages promising candidates should be assisted with bursaries provided locally.

After the recess it is hoped that arrangements will be made for a conference with the County Councils' Association on the details of the scheme; and, later, if the project be mutually acceptable, a combined deputation will wait upon the President of the Board of Education concerning the whole subject of Training of Teachers.

A. C.

NEXT MONTH

THE PRACTICAL TEACHER

will contain a highly interesting article on the Work of the Schools by

Mr. J. RAMSAY MACDONALD, M.P.,

as well as interesting papers on the International Hygiene Congress.

NOTES FROM THE NORTH.

FOR several years the Scotch Education Department has been taking a greater and more influential interest in the domain of Secondary Education. There has been at the same time, on the part of many teachers in Secondary Schools, a certain distrust of its action and a hesitation to accept the gifts, in the fear that their acceptance implied a more effective Departmental control, and a loss of that freedom and elasticity so long conspicuous by their absence in the Primary School. That there is need for co-ordination of the different types of schools—that there is need for the unification of authorities—that there is need for the "pooling" of the various sums of money allocated to education, goes without saying, and we are to-day as far removed from these ideals as we were ten years ago. The causes of this *laissez faire* policy in Scottish education it were difficult to define. Government has been slack. Public opinion has been somewhat inert. The only active agency in trying to do something to ameliorate the present stagnating—if not backward—tendency is the Department, to whom all honour is due. In its doing so there has been a perfect rain of circulars, regulations, and minutes. It seems to be the only way at its command. To teachers the deluge of circulars has been perplexing, to the public wholly unintelligible. Chaos is giving way under the Departmental's autocratic reign to organised system in some respects, and consequently a great advance in many directions has to be chronicled, and to be chronicled with great satisfaction. Gratitude has been defined as a lively sense of favours yet to come, and it is in that attitude that many of us look at the present regulations as to Grants to Secondary Schools which have just been issued.

Secondary School Grants.

* * *

ONE of the most powerful solutions of our educational difficulties is the allocation of more money. Many School Boards in Scotland have shown commendable enterprise with regard to the creation of Secondary Schools, but others have been deterred from doing so by the thought of the all-powerful ratepayers; so that, as a result, many districts in Scotland have literally been starved with regard to opportunities of higher education. Hitherto, the only grant allowed to higher-class schools in Scotland from moneys voted by Parliament has been a grant for instruction in subjects of science and art. Such grants were in use to be made to schools in Scotland by the former Science and Art Department, and they were continued on essentially the same principle by the Scotch Education Department after the transference to that Department in 1898 of the work of the Science and Art Department. It has, however, been long recognised that the placing of a premium on a single department of work in a Secondary School is educationally unsatisfactory; and it is now proposed to make the whole work of the school the basis of grant, and not merely certain selected subjects. As an effect of the Regulations, more adequate support will be given to Secondary Education. The grant allowed under the minute of May 30, 1903, amounted last year to £17,900. For the present year the grant is to be £44,500. The difference may be of great value to many of the schools, which are at present struggling to make ends meet.

More Money Available.

FOR the purpose of the Regulations a Secondary School is defined as one that provides at least a five years' course of suitable education to pupils, who upon entering have reached the standard of attainment in elementary subjects necessary for the Qualifying Examination. As this examination can only be passed by pupils who have reached twelve years of age, it follows that the course will extend from twelve to at least seventeen years of age. Application for grants are to be made by the managers of any such school which is not in receipt of grants under the Day School Code; but they will not be entertained in respect of any school which is conducted for private profit, or which is not either (*a*) a school under the same management as a State-aided school, or (*b*) a higher public class school, or (*c*) a school managed under the provisions of any Act of Parliament or scheme or Provisional Order issued pursuant to an Act of Parliament.

Conditions of Grants.

AS has been stated above, these grants are only obtainable by pupils who have passed the Qualifying Examination and are twelve years of age; but where the school comprises a junior or preparatory department, containing pupils who have not reached this standard, a curriculum for the instruction of such pupils must be submitted for the approval of the Department. This curriculum must make provision for instruction in suitable stages in English, history, geography, arithmetic, writing, drawing, singing, suitable physical exercises, exercises in hand and eye training, and nature study. It may further make provision for the initiatory study of a language other than English. For pupils who have qualified, the curriculum is divided into two kinds. (1.) For pupils who have not yet obtained the Intermediate Certificate, intermediate pupils must make provision for a course extending over at least three years in the following subjects—namely, English, history, geography, mathematics (including arithmetic), at least one language other than English (this not to be insisted on under certain circumstances), science, and drawing. (2.) For those who have obtained the Intermediate Certificate—secondary pupils—the proposals for more advanced courses of instruction must extend over not less than two years, and the curriculum must be submitted to the Department.

Curriculum.

EXCEPT in circumstances specially sanctioned by the Department, no class for instruction under one teacher should exceed thirty in number, nor may more than twenty pupils be taken at one time for any subject of practical instruction, such as experimental science. We do not see why the number of pupils to each secondary teacher is restricted to thirty, while in Primary Schools the Code still continues to hold that a teacher can teach sixty or more pupils. There is something anomalous here and needs amendment, and the sooner such amendment is made the better will it be for the schools of the people. The qualifications of all the teachers employed in giving instruction in each subject of the curriculum must be approved by the Department, and no school after August 1, 1908, will continue to be recognised as eligible for grants unless at least one teacher on the staff thereof for each of the principal subjects of the curriculum has been recognised by the Department as possessing the special qualifications specified in the Regulations for the Preliminary Education and Training of Teachers. The staff, too, must be sufficient in number to admit of the intermediate pupils being taught in at least three, and of the secondary pupils in at least two, separate classes according to their stage of advancement.

Staff.

GRANTS will be made for intermediate pupils at the rate of £3 on the average attendance, and for secondary pupils at the rate of £5. Two conditions, however, are made with regard to the award of these grants, and one of these is of exceeding importance, and might well have its counterpart in the Primary Schools. No school is to continue to be recognised as eligible for a grant in which, after due notice, the number of pupils completing the course and satisfying the conditions for the award of the Leaving Certificate does not, in view of the Department, bear a reasonable proportion to the total number upon whom grant is claimed. In the Primary Schools we should like to see a higher grant given to schools which have a reasonable proportion of qualified pupils to the total number on the school roll, for which average grant is paid. This would be one of the most powerful levers for increasing the attendance, and at the same time securing that the number of presentations for the Qualifying Examination was fully maintained. We commend this view to the Department. We do not think it is a wise policy for the Department to find fault with the scarcity of supplementary pupils, and to threaten withdrawal of grants: it would be better to increase the grants to those schools which do secure the better proportion. The second condition is equally important, and might have its counterpart in the Code for Primary Schools. In reckoning the average attendance on which claims for grants are calculated, no attendances may be reckoned on account of any pupil who has made less than 80 per cent. of the possible attendances from the date of enrolment.

Grants.

ON the whole, the Regulations for Secondary Schools are sure to meet with approval. As we have shown more than once in the course of these remarks, there are certain of the regulations which we should like to see finding a place in the Primary School Code. What is sauce for the Secondary School is sauce for the Primary School, and it is unwise to set up one rule for the one and a different rule for the other. With regard to staffing of schools, we are convinced that little progress will be made in the spirit of true education until the teachers in the Primary Schools are responsible for fewer pupils. There still exist many cases of large classes, and teaching in such is practically impossible. Martinetting is not teaching. One other question is likely to arise, and that is, Will the junior student centres be allowed to be classed as Secondary Schools for the sake of these grants? No doubt the Department will be called upon soon to answer this question. We notice from the new Regulations for Secondary Schools in Wales that the grants there are on a scale, beginning with £3, 15s., and continuing to £4, 5s., £4, 15s., and £5 respectively, slightly higher than in Scotland.

General Opinion.

WE referred in our last month's Notes to this important question, and the answers the Department had already given to queries on the subject.

Recognised Positions.

The Department has issued another circular. In it it is stated that the Department has had under consideration the question of the simplest means for giving effect to the provisions of Article 42 of the Regulations for the Preliminary Education of Teachers, in terms of which persons who were actually serving in recognised positions as teachers of higher subjects in Intermediate and Secondary Schools at the date of the issue of the Regulations (June 7, 1906) are entitled to take rank as specially-qualified teachers of the relative subjects in terms of Chapter V. of the Regulations. These subjects are English, French, German (or other modern language), classics, mathematics, science, history, and geography.

Dr. Struthers says: "To prevent misunderstanding, I am to explain that what is clearly contemplated in the Regulations is the recognition of a genuine specialist qualification, such as very few teachers are at all likely to possess in more than one or (at the most) two subjects. The primary requirement for recognition in terms of Article 42 will, therefore, be evidence that the teacher has actually held an important and responsible position in the school in connection with the teaching of the particular subject for which he claims special recognition." In fact, he but repeats what he had previously said in answer to the memorandum referred to last month. The addition, however, is important, and may embrace, as we trust it does, a recognition of the fact that a teacher's experience is to count for something. The Department, it is added, is now prepared to consider claims for recognition in terms of Article 42, which must be made through the managers of the school in which the teacher was engaged at the date of the Regulations. We trust that the recognition will for some time to come err on the side of leniency, or it would be manifestly unfair to a great number of teachers who have for years done excellent work without these special qualifications referred to. In Regulations for Secondary Schools quoted above, it says no school after August 1, 1908, will continue to be recognised as eligible for grants *unless at least one teacher on the staff thereof, for each of the principal subjects of the curriculum, is specially qualified under Chapter V.* We think, if this is an indication of the Department's policy, that leniency will be the order of the day.

GREAT as was the increase in the membership of the Institute last year, that is completely outdone by the great addition to its ranks made this year. The financial year of the Institute has just closed, and we are led to believe that there has been a gain of nearly 2,500 new members. This means a great addition to the power of the Institute, which at the present time has on hand much useful and valuable work. The union spirit in the teaching profession has this year been clearly manifested, and this is but one of the evidences of its force. There are now nearly 12,000 members; and when it is considered that the teaching profession in the public schools of Scotland numbers 14,084, it will be seen that the profession is pretty united.

The Doings of the Institute.

The elections have now come and gone, and few, if any, surprises have to be registered. The Presidentship has been secured by Mr. J. M'Whan, Cambuslang, to whom we wish a most successful year. His work on the Emergency Committee has thoroughly deserved the greatest honour the Institute had to bestow, for in season and out of season he has devoted himself to the work of that committee. And, unfortunately, the present year has by no means been the lightest.

The Institute is deeply gratified to see in the list of birthday honours that of the venerable Principal of St. Andrews, Dr. Donaldson. At one time he was President of the Institute, and lately received at its hands the degree of Honorary Fellow. We extend to him our best wishes, and trust he will be long spared to enjoy this added honour.

R. D.

THE EXPLORATION OF AUSTRALIA.

BY J. F. UNSTEAD, M.A., F.R.G.S., LECTURER IN GEOGRAPHY, GOLDSMITHS' COLLEGE, UNIVERSITY OF LONDON.

IF a series of lessons is to be given upon some large region of the world, it is usually desirable to begin with one or two "introductory lessons." These would aim at giving a general idea of the region before the details are studied, so that in the later lessons the various matters are seen in their proper setting. The facts of geography are so closely inter-related that they cannot be appreciated singly; hence the importance of knowing something of the region as a whole, before studying either particular features, such as relief and climates, or smaller portions of the region, such as one political unit in a continent.

But there is often a difficulty in drawing up the introductory lessons. If a careful study of cause and effect in the details is to be left till later, there is a dangerous tendency to a bare statement of the larger facts or the mere teaching of the names in the region, such as those of the more notable mountains, rivers, and towns. Frequently an imaginary voyage around the coast or a journey across the land is described; and if skilfully taught, these may be very useful. There is an element of artificiality about these, however, and this can be entirely avoided, and much more interest gained, by accounts of the actual journeys or voyages of travellers. The most fascinating of these are the stories of the exploration of the country: the stories have an atmosphere of daring and adventure, of perseverance and heroism, which compels an interest extending from the doings of the men to the scene itself. In such a connection the descriptions gain immensely in reality, and the absorbing interest ensures permanence of the impressions gained.

The New World, Africa, and Australia can be treated in this way, and the purpose of the present article is to tell part of the long story of exploration in Australia from this point of view. The many wonderful journeys give abundant material, and the chief problem is that of selection. This work must be done bearing in mind that the end of the lessons is to teach the chief features of the continent, and so the travels utilised should be concerned with all parts of the continent, giving each part its due allowance; also the chosen portions of the narratives should illustrate the salient features of the district, and especially the relief, climate, natural

vegetation, and its suitability as the home of man. First, then, the teacher must decide upon the essential facts of the geography, and then select and arrange the exploration story, that these may be clearly and naturally brought out in the telling.

Although there is some indication of Australia to be found on French maps of nearly four centuries ago, it was not till 1606 that the continent really became known. In that year a Spanish expedition from South America and a Dutch expedition from Java reached the continent almost at the same time and place. The Dutch set out to explore New Guinea, and leaving the south-west of that island and sailing southward, reached the Gulf of Carpentaria. The Spanish expedition when near the south-west of New Guinea encountered a storm which drove one of the ships, commanded by Torres, westward, until it passed through the strait now bearing Torres's name; thus he saw the mainland of Australia, although he did not realise it to be a great continent, but thought of it as a group of islands.

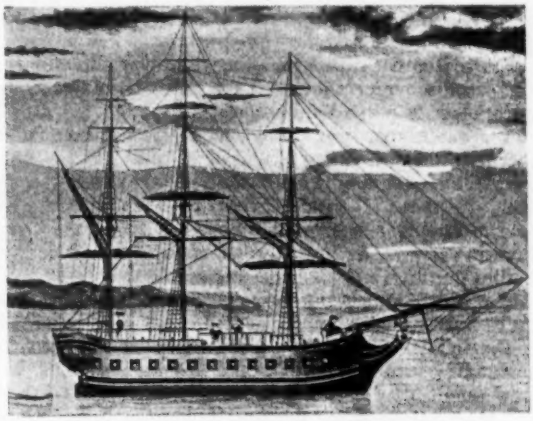
Soon after these discoveries were announced, a whole series of Dutch navigators reached the shores, and in 1642 Tasman discovered Tasmania (which he named Van Diemen's Land), though it was not till long after that it was found to be an island, and not part of the continent. Many names around the coast bear witness to these early Dutch discoveries, and the old name for the continent, "New Holland," has, of course, a similar origin.

The first Englishman to visit the land was Dampier, who in a pirate ship reached the north-west coast (Dampier Land) in 1688. He found a low and sandy shore, destitute of water, most uninviting in itself, and with inhabitants whom he described as "the miserablest people in the world.....setting aside their human shape, they differ little from the brutes." Eleven years later, in a King's ship, he again visited the north-west coast, but again obtained a very poor impression of the land. The sailors were in great need of water, but this almost rainless region offered little. They made a long search at various points, but only brackish water was found, and the expedition then sailed away.

Nearly a hundred years afterwards (in 1770) came the great discovery which began the real history of Australia. Captain Cook on his first voyage round the world reached the south-east corner of the continent, and found it a very different country from that described by Dampier. Here there is no lack of rain, and the land is fertile; also the climate is cooler, and in every way the region is more agreeable to Europeans. Captain Cook went northward along the east coast, and named a bay where they stayed "Botany Bay," because of the wealth of new plant life found there. The coast was explored as far as Cape York, and the ships encountered both difficulty and danger from the Great Barrier Reef of coral off the north-eastern shores. Indeed, the *Endeavour* ran on a coral reef, but fortunately a jagged piece of coral stuck in the hole and acted as a plug until the accident could be repaired. While this was being done, small excursions were made on the land, and the first kangaroo was seen. Cook took possession of the country for England, and called it New South Wales.

He reported so favourably upon it that the English Government, wishing to get rid of some of the extraordinarily numerous criminals and prisoners of the time, sent out nearly a thousand convicts to form a colony in this land, which had the advantage of being almost the farthest possible away from England. The ships arrived at Botany Bay in 1788, and the penal colony was established near there at a magnificent harbour, Port Jackson, upon which Sydney now stands.

The colony was expected to live by farming, but the convicts were not at all suited to that life; only one man in the whole settlement was able to teach the rest, and he died a year or two after arrival. The Government had provided the people with some seeds, agricultural implements, and a store of food; but all these were insufficient, and for long the colony was lacking food, and starvation was imminent. Some stores and more convicts came in a year or two; the settlement struggled on, slowly increased, and to an extent prospered. The settlers cultivated the land, and had some thousands of cattle, sheep, pigs, and goats. A map will show that there is only a comparatively narrow strip of lowland between the sea and the mountains. This strip is from twenty-five to fifty miles wide, and the Blue Mountains shut it off from the interior by a continuous and, at that time,



CAPTAIN COOK'S SHIP, THE "RESOLUTION."

impassable barrier. The welfare of the settlers depended upon the success of their crops and enough grass for their animals, and both of these depended upon a sufficiency of rain. But the rainfall of Australia is curiously fluctuating; there are cycles of a few years of fairly heavy rainfall, and a few years of very slight rainfall, so that a country that is fertile in the good years may be dry and almost bare in the bad years. Such bad years came to the settlers, and they turned longing eyes to the mountains, hoping that on the other side things might be better. Attempts were made to cross the barrier, but for long without success. The rivers flowing down the flanks had cut valleys that promised roads through; but when these valleys were followed some distance they narrowed into ravines, whose sides grew steeper and closer together as the travellers proceeded upward. At last there would be a mere cutting in the mountains, which ended perhaps in a cleft too narrow and steep for climbing. Elsewhere the ravines met and formed a maze that wasted the energies and stores of the explorers, until hope of crossing the mountains was almost abandoned.

In 1813 drought led to a struggle to find a road, which at last met with success; and on the other side the adventurers found grassy upland plains which

became more and more bare as the mountains which caused the rainfall were left behind. The early travellers found nothing but grass, and the district seemed uninviting; but now fruit and wheat are grown, and there are vast numbers of sheep reared on these plains. Yet still the bad years come, when the farmers with all their modern knowledge and resources have to struggle against the drought, and in the most unfavourable parts they may lose their stock.

Two years after the first crossing two rivers were discovered, and named the Lachlan and Macquarie; and the Lachlan was later traced down for some hundreds of miles, until it was lost in an enormous morass which seemed to have no definite boundary. The explorer Oxley wrote: "It became evident that it would be impossible to advance farther in the direction in which we were travelling. The stream here overflowed both banks, and its course was lost among marshes, its channel not being distinguishable from the surrounding waters..... We had the mortification to perceive the termination of our research, at least down this branch of the river. The whole country from the west, north-west, round to the north, was either a complete marsh or lay under water, and this for a distance of twenty-five or thirty miles in those directions." Next year the Macquarie was followed, till it too spread itself far and wide over the country, and its discoverer thought that these sheets of water were parts of a great inland sea occupying the interior of the continent, into which the rivers drained. Farther to the south the Murrumbidgee and Murray rivers were found running westward, and were followed for some distance; then the rivers were left, and the explorers recrossed the mountains, here called the Great Dividing Range, and reached the great harbour of Port Phillip, on which Melbourne was afterwards built.

The next important discovery was the fact that these four rivers were connected, and this was made in the following manner. Captain Sturt followed the Macquarie into its marsh, and found that this was only about fifty miles long and twenty miles broad, and that on the other side was a chain of ponds draining into a dry channel, which evidently carried off the marsh water in wet seasons. He concluded that this was really the dry channel of the Macquarie, and found lower down the channel a river going northward, until it joined a larger river flowing to the south-west. He named this the Darling, but was not able to follow it far to the south. Later, Sturt explored the Murrumbidgee, and found that it received the waters of the Lachlan after this had drained through its marsh. Then much farther on he discovered that the Murrumbidgee joined the Murray, whose upper stream had been crossed previously. Going down this to the west, he encountered a great river coming from the north, and this he supposed to be the Darling. Sturt's diary gives an interesting account of how the discovery was made. "As we sailed down the reach we observed a vast concourse of natives under the trees, and on a nearer approach we not only heard their war-song (if it might so be called), but remarked that they were painted and armed, as they generally are, prior to their engaging in deadly fight. As I did not wish a conflict I lowered my sail, and putting my helm to starboard, I passed quietly down the stream in mid-channel. We were again roused to action by the boat striking upon a shoal, which reached from one side of the river to the other. To jump out and push her into deeper water was but the work of a moment with the men, and it was just as she floated again that our attention was withdrawn to a new and beautiful stream coming apparently from the north. .....The various conjectures I had formed of the course and importance of the Darling passed across my mind. Were they indeed realized? An irresistible conviction impressed me that we were now sailing on the bosom of that very stream from whose banks I had been twice forced to retire. I directed the Union Jack to be hoisted, and giving way to our satisfaction, we all stood up in the boat and gave three distinct cheers." Thus it was found that the drainage of the whole of the great region behind the mountains enters the sea through the mouth of the Murray. As he journeyed westward Sturt noticed how dry and barren the land became except close by the river; but when the Murray turned south to enter the sea, a fertile country was again traversed.

(To be continued.)

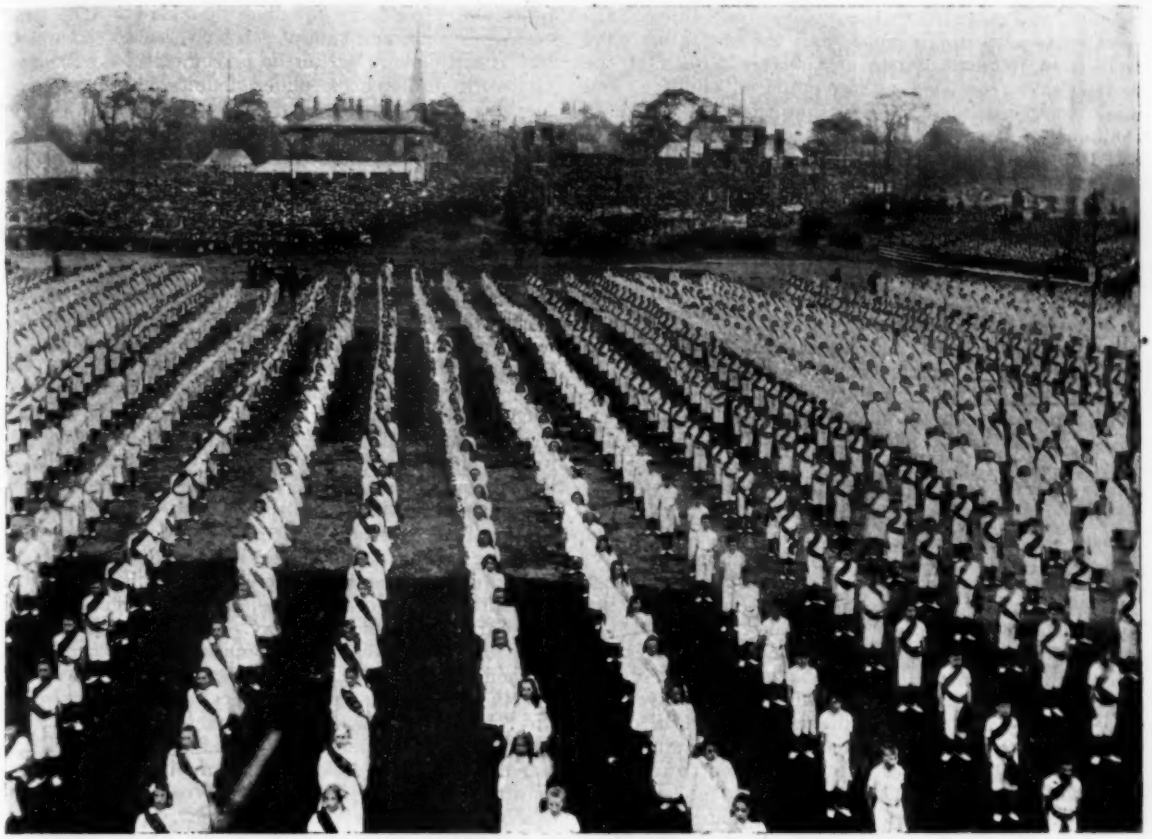
THE LIVERPOOL PAGEANT AND THE SCHOOL CHILDREN.

IT was only fitting that, in the splendid series of *fêtes* which have recently marked the attainment of the seven hundredth year of Liverpool's corporate existence, the children of the city should play a representative part. Some doubt at first existed as to the form which the children's demonstration should take, but it was finally decided that a display of physical exercises on a large scale would be most appropriate, as affording a means not only of effectively aiding the pageantry, but also as indicating that Liverpool's proud progress is not merely confined to her commerce, her wealth, her influence, and her civic amenity, but is equally evident in the schoolrooms of the city.

As soon as the machinery of the pageant arrangements was set in motion, the children's part of the proceedings was relegated to a special committee, with Mr. J. G. Legge, Director of Education, as chairman, and Mr. P. Smith, Assistant-Director, as secretary. This committee consisted of certain members of the Education Committee and a number of representative teachers.

The members having decided that a physical exercise display would be the most appropriate, the teachers and children of the elementary schools were invited to offer their services. Here the first real embarrassment—an *embarras de richesses*—arose, as, notwithstanding the fact that the offer meant considerable self-denial during part of the holiday period, the numbers who volunteered, both of teachers and children, far exceeded that which the ground could accommodate. Finally, squads of twenty were accepted from the schools volunteering, the total number arranged for being two thousand, boys and girls being equally represented.

The question of costumes next engaged the attention of the Committee. To obtain that perfect uniformity which was considered essential, it was felt that the matter could not safely be left in the hands of the parents, and the Committee decided to provide the costumes, consisting of white overalls, white shoes, and coloured sashes for the girls; and white jerseys,



PHYSICAL DRILL BY TWO THOUSAND CHILDREN.
(Photo by Mowll and Morrison.)

knickers, shoes, and coloured sashes for the boys. The only articles which the children had to provide were black stockings. Tenders were invited for the supply of the equipment, and arrangements made for ascertaining the various sizes of each which would be required by the children of each school. These costumes were presented to the children on the conclusion of the pageant.

Now came the selection of the exercises to be performed. It was felt that they must be sufficiently typical of a system which develops the whole body, and yet contains sufficient variety and action to make the movements effective as a display. The actual programme of exercises was left in the hands of Sergeant Patterson, drill instructor to the Liverpool Education Committee, and he made an admirable selection. The exercises consisted of three groups—the first being mainly concerned with movements intended to produce flexibility of the joints and the stretching of the body and limbs; the second introduced trunk bending and balancing; while the third continued the trunk movements, and included a number of lunges. The whole concluded with marching exercises in various steps, including those with the heels raised, the knees raised, hopping, changing step, and skipping with forward and side step.

The selected exercises were printed, and a copy given to each of the two thousand children concerned, and the drilling of the various sections of twenty was conducted at their own schools by their own teachers. As soon as sufficient advance had been made, joint practices in companies of four hundred were arranged at five centres in different parts of the city, and here Sergeant Patterson took charge. Finally, four general rehearsals were arranged on the actual arena; and the result was such a perfect display of drill on a large scale that nothing but praise of it has been heard on every side. The *Tribune* observed: "The honours of the Liverpool pageant go to the children. Looking back upon the bewildering wealth of mediæval colouring.....one realises that the most memorable episode was the musical drill of two thousand school children, simply clad in white, relieved only by coloured sashes. The evolutions of the youngsters provided a scene of wonderful beauty. With the precision of a machine the vast crowd worked itself into patterns that startled by their mathematical exactitude."

In addition to the present of the costume, the children were generously refreshed on each of the days of the display. A neighbouring school (Clint Road—Headmaster, Mr. E. B. Parrott, who was John Leyland, the antiquary, in the pageant) was utilised for dressing and refreshment. Each day the children came and went to and from their homes in their ordinary clothes, the uniform being donned at the school, each room and section of it being clearly labelled with the name of the school to which it was allotted. After the performance the children returned to these rooms, and again changed their clothing.

As the children entered the arena to the strains of

a band, and marched to their places four abreast, the effect was surprisingly good, and the spectators were moved to frequent bursts of applause. Each of the ten columns consisted of two hundred children, and they took up their allotted positions in alternate columns of boys and girls. Each individual line of children from front to back was distinguished by the same coloured sash; and as these were broad and artistically arranged, they provided a distinct relief in colour to the bodyground of white. When in the marching and counter-marching the six different colours of sash were intermingled, a most pleasing colour effect was produced.

After the performance the children left the arena at the double in columns four abreast, a column of boys and one of girls moving off at the same time, but in opposite directions, around the arena; and this movement was undoubtedly one of the most effective episodes of the whole performance, which was distinguished by a rhythm, accuracy, and grace which has rarely, if ever, been seen on such a large scale before.

This result, as has been already indicated, was not attained without weeks of assiduous preparation and the curtailment of the cherished midsummer holiday, yet the teachers concerned all felt that the sacrifices entailed were far more than repaid. One phase of the operations of the public elementary schools of the city was illustrated in the most effective way imaginable, and parents and the public generally were impressed as they have never been before. Liverpool was proud of its pageant; it was prouder still of its school children, and some of the reflected glory undoubtedly illumined the teachers. Too often the figure-heads and not the actual workers are publicly applauded and honoured. Liverpool, however, was an exception, for the Lord Mayor at the Town Hall and Lord Charles Beresford on the *Edward VII.* amply and generously recognised the labours and extraordinary success of those who had actually organised and conducted the display. It is hoped that this brief description will impel teachers in other towns afflicted with pageanticitis to go and do likewise. May they attain an equal success and as large a measure of personal satisfaction as their professional brothers and sisters in Liverpool!

F. W. ANGELL.

THE TEACHING OF ARITHMETIC: PAST, PRESENT, AND FUTURE.

BY A. CLEMENT JONES, M.A., PH.D., AND
C. H. BLOMFIELD, M.A., B.SC., BRADFORD GRAMMAR SCHOOL.

THE older methods of teaching arithmetic were tedious, uninteresting, lacking stimulus, and therefore wrong; the tendency of later years has been to eradicate this cumbrous machinery from our elementary schools. But the process of elimination is not complete, and in some of our secondary schools scarcely yet felt; hence some discussion of these methods may not be out of place. Arithmetic was divided up into a large number of watertight compartments; each compartment was duly labelled, and all matter relative to it carefully secured within. Each compartment was termed a "rule," and before proceeding to the solution of any question the pupil's object was to decide the rule to which it belonged; any, even slight, variation in the form of the query elicited from the pupil the objection, "We have not done that kind." This process of division and subdivision has been so elaborated that nearly every writer feels compelled to arrange the work of his book under definite headings, commencing with Addition, and ending with Races, Games of Skill, Work, and so on. The evil of this system has been increased, especially in the early part of arithmetic, by the teacher expecting pupils to become proficient in each rule before proceeding to the next. The children add, add, add, until they can obtain the correct answers to the addition of large abstract numbers quite beyond their powers of comprehension. They then proceed similarly with subtraction. The root idea, the application of the rule, is lost sight of amidst the difficulties of number manipulation; the whole subject becomes a dreary grind, the arithmetic lesson a period of torture. How many of the older generation look back on the once celebrated Dr. Davis's *Arithmetic* with pleasure—the maximum number of figures, the minimum of verbal expression; all arranged in packs—such long packs—and every sum in each pack alike! Even in more modern text-books the application of the rules is scantily dealt with. A few "problems" are grafted here and there on to the old dead trunk, half a page of relief, and the pupil is passed on to more deadly dull mechanical calculation. In no other subject is this rigid division into parts considered necessary. In teaching languages it is found advisable to let pupils make up sentences as soon as a few words have been learned, and thus to put these words to some practical use. In the same way, the use of every mechanical method—such as, say, addition or multiplication—should be at once illustrated by as many and various problems as possible. Now the problems in Part II. of the ordinary text-book can be to a large extent done by any boy who understands the meaning of the four simple rules, provided the numbers employed are kept small. The object of this article, then, is to point out the objections to the older methods, and to suggest a substitution for the weary grind of mechanical arithmetic, with its four-lined addition succeeded by eight lines, and when eight lines have been successfully practised, followed by the duller twelve. We wish to advocate the immediate application of the earliest mechanical skill, the teaching of ideas rather than mechanical drill, and encouragement to ask the reason why. We want a definite connection at every step between the science of arithmetic and its application. Up to the present a boy has been expected to develop suddenly powers of solving problems and applying "rules" at the precise moment when he passes from Part I. to Part II. of his arithmetic. It is an unreasonable and rarely satisfied expectation. The characteristics of the new methods are:—

1. *The immediate application of the first knowledge which the pupil acquires in the manipulation of numbers.* Can the boy add four and five and subtract five from nine he is in a position to apply his skill, and any easy question involving such simple addition and subtraction, always of quantities which he comprehends, may be reasonably asked. The method is to be maintained throughout. The French writer Laisant expressed this as follows: "It is not images of figures or formulæ which ought to leave their impress on the brain; it is rather the faculty of reasoning."

2. To make this possible it is advisable that *all manipulation of large numbers should be deferred* until the pupils are of such age as to be able to comprehend these larger numbers. The whole principle, for ex-

ample, of reduction can be learned as well by finding the number of pence in £1, 7s. 4d. as in reducing £31,472, 16s. 8¼d. to farthings. The former can be understood by the young child; and by giving him a large number of problems the solutions of which require such reduction (for example, How many fourpenny cakes should I get for £1, 7s. 4d.? All the children in a school subscribed a penny to a charity; the total was £1, 7s. 4d.: how many children were there in the school? etc.), the child will see the need for accurate work. The latter example cited above can present little real meaning to him; and further, it is extremely doubtful whether in the whole course of his life he will ever need to know the number of farthings in so large a sum of money. Further, the time employed in working out such large reductions can much more profitably be spent in applying the pupils' skill in smaller reduction sums. Another valuable result of postponing such large calculations is that it reduces the number of exercises of any one type necessary, and enables the writer of a text-book to group several types together without causing confusion; for the minds of the pupils are not distracted from the principles involved by the largeness of the operations required.

3. *The subject is made interesting from the beginning.* There is no need to insist upon questions being of a utilitarian character—children are not utilitarians from the same point of view as the university professor—but the questions must appeal to them as worth the doing. Some writers have fallen into the fallacy of over-estimating a child's intelligence. A child does not carefully estimate the future use of the work in hand, but the extent of its immediate interest decides the extent of his attention. It is a difficult point to decide whether any particular question will arouse interest, and experience only can decide this point. It is doubtless the common experience of every mathematical master that boys, for example, readily try to find how much gold leaf will be necessary to cover a cube, when they will reluctantly find the area of a rectangle; or, again, will take pleasure in finding the height of a hotel, when the solution of the corresponding right-angled triangle would seem to them a dull exercise. To quote again from Laisant: "The problem is eternally the same—to interest the pupil, to stimulate research, to give him constantly the feeling—or, it may be, the illusion—that he himself discovers what he is taught." The work is not to be dictated to the pupils as a series of dogmatic rules, but the development of the child's reasoning powers is to be the first and most urgent aim of the teacher. "The pupil has in general no initiative, because the taste for it has not been communicated to him. He has been used to work and to learn, but hardly to understand, and not at all to find out, a way for himself."

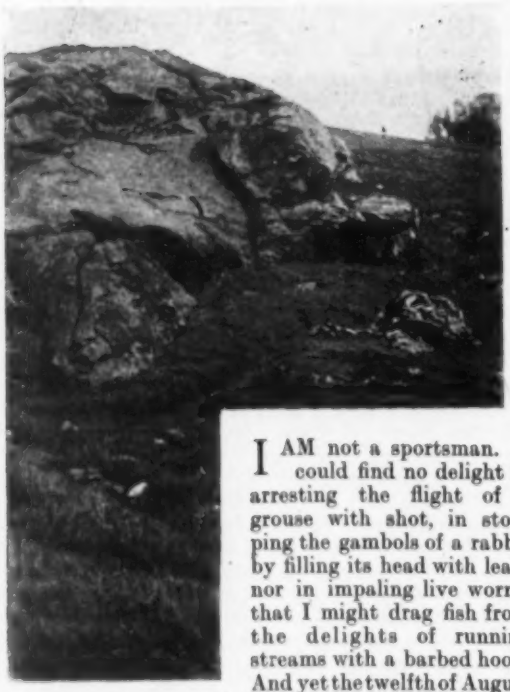
The subject of arithmetic, again, can be made more interesting by extending it, and the removal of the manipulation of large and clumsy quantities from the early course leaves time for such extension. The elementary ideas of algebra and geometry are simple extensions of arithmetic, and every opportunity to introduce them should be taken. The general expression of arithmetical results by algebraical symbols presents much less difficulty to a child than might be expected, provided the habit is early acquired and examples occurring in their limited experience are adduced—such as *s.* for shilling, *d.* for pence. For example, children have in the past learned square measure, and done many exercises in reduction and the like, without any clear idea at all of the nature of an area or the reason for the relation between this and linear measure. This can be tested by any schoolmaster by varying the question. The pupil is taught that 12 in. = 1 ft., etc., and 144 sq. in. = 1 sq. ft., etc.; but knowing this, he can rarely deduce that 16 sq. in. = 100 sq. cm. from the statement that 4 in. = 10 cm. This shows that the underlying principle has not been recognised; and yet this one arithmetical "rule" contains the geometrical idea of area, and can be readily expressed by algebraical symbols. Diagrams should be drawn (such as dividing a square with 2, 3, 4, etc., inch sides into square inches; two squares with sides 4 in. and 10 cm. into sq. in. and sq. cm. respectively; a square foot—that is, a square with side 12 inches—into sq. in., etc.) until the relation between the tables is clear. We would go further: every effort should be made to get the child himself to discover the square measure from the linear. As soon as area is understood, such abbreviations as $A = \angle B$ for the area of a rectangle should be introduced, and the elements of algebra thus gradually brought before the pupil. In short, the teacher should always be ready to intelligently anticipate future work. We would not be misunderstood; we do not ask the teacher to give a full and elaborate exposition of his own knowledge; we would not even frighten the pupil by labelling the work being done. The words algebra and geometry need not occur; the meaning of $a \times a$ can be taught without any learned *excursus* into the theory of indices. This warning is undoubtedly necessary, unless the suggestions here given are to prove harmful rather than helpful.

4. *A generous use of oral questions.* In beginning a fresh part of a subject we have generally found it advisable (*a*) for some little time before the new ideas are introduced to make use of questions more or less bearing on the point. This helps to clear the ground, to arouse interest, and to make a definite connection between the parts of the subject. Further, it is always useful to be able to refer back when new work is being introduced. Thus, for example, one would suggest several ideas about fractions when simple multiplication and division are done. (*b*) To make a clear statement, with both positive and negative examples, of any new words or terms which may be employed, not introducing, of course, more of these than are absolutely necessary. Formal definitions, to be learned by heart, are seldom of any value whatever to the child, except, perhaps, an examination value. In the case of H.C.F., for example, the real meaning is obscured by the definition, and it is doubtful if one in a hundred pupils understands that it is only the common divisors that are required in arithmetic and algebra alike. (*c*) To ask a *series* of oral questions. This presents some difficulty, for in most sums there are only at the most three or four things which can possibly be done with the numbers provided — for example, add, subtract, multiply, or divide; or, again, in profit and loss, to multiply by $\frac{100 \pm x}{100}$ or $\frac{100}{100 \pm x}$. Frequently the answer given is three parts guess and one part reasoning. Care is needed, then, not only to get the correct answer to the question, but further, by a series of questions, to see that the answer has been arrived at by correct reasoning. Even then there is the further danger that the reasoning itself is merely remembered and will be easily forgotten.

(To be continued.)

CAM'RA AND I.

BY LE FLÂNEUR.



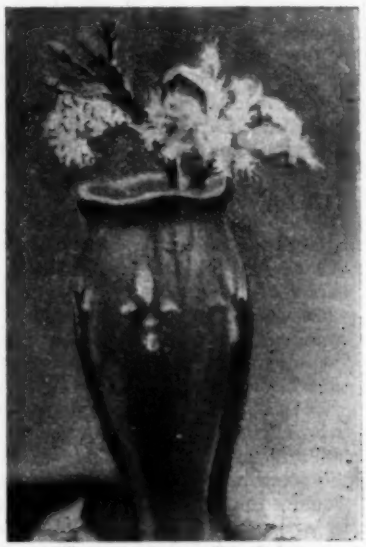
I AM not a sportsman. I could find no delight in arresting the flight of a grouse with shot, in stopping the gambols of a rabbit by filling its head with lead, nor in impaling live worms that I might drag fish from the delights of running streams with a barbed hook. And yet the twelfth of August found me on the moors, but pointing at the grouse and curlews no more harmful weapon than the two barrels of my field-glasses. The only shots I had were snap-shots. In the shooting season the owners of the moors and their friends are rather a trial, rudely exploding their sudden guns in the midst of my observations; but they leave me alone during the greater part of the year, obtruding no other traces of their passage across the heather than a few spent cartridges and an occasional champagne cork.

Cam'ra and I managed to secure some views of Addleborough, the hill that dominates the head of Wensleydale, and we studied together limestone, Yoredale rocks, and millstone grit; but of these matters hereafter. Meanwhile I renewed acquaintance with my old friend the Bog Bean, the *Menyanthes trifoliata* of the botanist, still interesting, though its flowering season belongs to an earlier part of the summer. Some people call it the Buck Bean, and writers are not agreed whether this or Bog Bean is its original name; but as the plant shows a preference for bogs, and as French folk call it *trèfle des marais* (bog trefoil), it may be that the more picturesque and descriptive name is the right one, notwithstanding that almost all the old herbalists call the bean the Buckesbean. Our German friends call it Bocksbohne; and as they deem it a remedy against *scharbock* (scurvy), they know it also as *Scharbock's Klee*. In this country, too, its leaves are held to have curative properties, dispelling or mitigating fever, and acting as a tonic by virtue of the principle known as Menyanthin which they contain.

A WASP'S NEST.

The extreme bitterness of the leaves makes it available as a very cheap substitute for hops, for two ounces of dried leaves will go as far as one pound weight of hops. Possibly, now that brewers have become more sophisticated and avail themselves so eagerly of the resources of chemistry in their lucrative operations, they have ceased to use the leaves of the humble bog bean; but in any case a decoction from this plant is harmless, and not like those fell draughts of arsenic with which the publicans of Manchester began to regale the working-men of the city a few years ago with such fatal results.

The creeping stems of the bog bean are charged also with farinaceous matter, like starch, and the Lapps and Finns, drying the rhizomes, powder them; and with this flour, which has been washed to rid it of some of its bitterness, they make a kind of bread, which, if it is not as appetising as a home-made Yorkshire loaf, is not devoid of nutriment.



FLOWER OF THE BOG BEAN.

The flower of the bog bean is one of the most handsome of the wild flowers, and if it is not often seen in the south of England it may be found in the north; though even there it does not flaunt its beauty on the highways, but needs that you shall "seek it out of desolate places." Hence its partiality for the moors. The bog bean is a perennial, and its root stock is thick and creeping; its flowers, three-quarters of an inch across, are white, tinged with pink on the outside. disposed in an irregular whorled raceme with three flowers in a whorl, and densely bearded with thick hairs on the inside. It is a flower that may be cultivated in the garden if it is supplied with peat and with a generous supply of water.

By a descent from the moor Cam'ra and I came to the hamlet of Thornton Rust, and in the schoolmaster's garden there we found in a gooseberry bush a nest of the *Vespa media*, one of the thousand known species of wasps. This insect made paper long before man had so much as appeared upon the earth at all; and though other wasps made their homes in the ground, this one slings its beautiful nest amongst the twigs of a bush in such a way that it looks like a miniature Chinese lantern that has been left after a fairies' garden party or midsummer night's dream. I wonder if the Chinaman took the hint from *Vespa media?*

The outhouse doors hereabouts bear testimony to

the industry of the wasps, and you can hear these busy paper-makers quite distinctly tearing away the woody fibre; and the sound is as though there were a score or more of elfin saws at work. The wasps masticate the wood, and so pulp it as the paper manufacturers, by other means, pulp fibre. A glutinous saliva which the wasp secretes helps to reduce the tough material to the paste which, spread into a thin sheet, becomes paper.

These intricate and beautiful nests are commenced by the queen wasp, the sole survivor of the winter; but at length she has the assistance of the workers amongst her children, who help to complete what she has so well begun. The internal combs are one cell deep, and these cells are not filled with honey, for the wasp does not store like the bee. The cells are occupied instead by the eggs and the grubs. The builders of these interesting nests work hard, and a wasp has been known to toil from four in the morning until fourteen minutes to eight at night without a rest.

THE SCHOOL AND THE LIBRARY.

BY WILLIAM WILSON, PUBLIC LIBRARY, GATESHEAD.

THERE has lately been aroused in influential circles a strong and favourable opinion as to the advisability of bringing the various educational institutions within our cities and towns into close relationship. The end in view would appear to be the substitution of a united educational effort within each administrative area in place of what at present is in too many cases a number of isolated agencies, each equally hard at work in its own way, but productive of only a fraction of the good which might be accomplished were they to work hand in hand. In no connection is this movement more marked than in the relations which exist between the public elementary school and the public library.

It is many years now since the possibilities of the library proving supplementary in its function to that of the school were recognised, and the methods and experiences of the pioneer library and educational authorities in this matter were incorporated in a publication of 1899 from the Education Department, entitled "Special Report on the Connection between the Public Library and the Public Elementary School." Up to the present ideas have seemed to centre round the opinion that the books forming the juvenile collection should be split up into smaller libraries, and housed in the respective schools either permanently or by rotation of the various groups, and from thence borrowed by the children under the supervision of their teachers. Now, however, in many instances this opinion is giving place to one which prefers that the library shall be the meeting-place of the children with the books, and it is the superiority, in his opinion, of this latter method which the present writer wishes to emphasise.

At the outset it is suggested that children are as jealous of their individuality as are adults, and infinitely prefer to choose the books which they shall read than to have them chosen for them. The truth of this is borne out by persons who have risen to eminence through making the best use of their reading, and all will remember Ruskin's advice to turn the child loose in the library. This desirable and necessary exercise of freedom on the part of the child may or may not be fostered at the school. His reading should be to him recreation in the fullest sense, and it can readily be conceived how it would cease to be so if, for fear of offending, he read books recommended by a teacher, but which he found to be quite uncongenial to his taste. There is no doubt that the relation of pupil to teacher is not always (there are conspicuous exceptions) of that nature which permits of the greatest freedom in the bearing of the younger person towards the elder, inasmuch as the restraint of the classroom cannot wholly be eliminated from the mind of the former. This was doubtless in the mind of an eminent American librarian when he stated that a great drawback in the school library system of his country was the absolute distaste for reading produced in some instances in the minds of children by the practice of certain teachers in requiring an essay from their pupils on the subjects of the books loaned from the school library. Such a proceeding is anything but conducive to the love of reading, as many will affirm who remember, with feelings somewhat akin to pain, being compulsorily made parties to the collective reading and ruthless dissection of English classics in their bygone school days.

There is no reason, of course, to suppose that any but a very small percentage of teachers would interfere in this way, for, on the contrary, the great majority of them would condemn the practice referred to as being certain in almost every case to defeat its own ends; furthermore, the same objection would hold good to any undue interference on the part of librarians, or even parents. The time for the exercise of supervision as to what juveniles shall read is at the initial stage when the books which are to form their library are selected. The field from which selection may be made is very extensive, and, accordingly, necessitates an evaluation at a point determined by the financial ability of the purchasing authority. The average stock of works exclusively for juveniles found in municipal libraries may be stated at a number between 1,200 and 2,000 volumes. In many cases the selection is further limited by the age of those eligible as borrowers being fixed in some libraries at twelve or even as high as thirteen years. Happily, this unwise restriction is in other cases being rapidly abolished, and the ten years' limit made to obtain. Even this should be retained only as a saving clause, and children below that age accepted as borrowers at the discretion of the librarian or on the special recommendation of parent, guardian, or teacher.

This last practice is at the present time much in favour, and will almost certainly be generally adopted in the immediate future. And surely it were an anomaly to talk of the connection between the library and the school, at the same time excluding from consideration the scholars of the infant and junior departments. The public library ought to be made to attract the young and the old, and, consequently, its selection of books should include those beloved of children even at the picture-book age. It has been found in practice that such books are eagerly obtained from the library by children, who take them home to their younger brothers and sisters, the latter being themselves too tiny to be entrusted with the carrying of a book through the streets.

Although the subject of book selection cannot be

dealt with in a short article, it may serve a useful purpose to mention the fact that such picture-books are not nearly so difficult to obtain as hitherto. Enterprising publishers have spared no pains in obtaining the services of many eminent artists, not only in illustrating the old favourites, but also in giving point to the best work of present-day children's writers. There are editions of *Uncle Remus*, *Grimm*, and *La Fontaine*, illustrated by René Bull and others; *The Chums*, *The Twins*, and *Our Diary*, from the pencil of John Hassall; and the works of Ruth Cobb—all from Messrs. Nelson and Sons' house; Miss L. S. Mâcdonald's *Babies' Classics*, with beautiful illustrations by Arthur Hughes, and a charming edition of Stevenson's *Child's Garden of Verses*, with the daintiest of pictures by Jessie Willcox Smith, from the firm of Longmans, Green, and Company; and many others. It is impossible, however, to do justice to all the writers, artists, and publishers engaged in this fine work, and the present writer would direct all those desiring further information on the subject to an excellent article and bibliography appearing in this year's February issue of the *Library World*, entitled "Books for very Young Children." This is from the pen of Mr. James Duff Brown, Borough Librarian, Islington, a well-known expert on all library and bibliographical matters, who has recently been asked by the London County Council to act as adviser to their Education Committee in the matter of selecting books for juvenile prizes.

Teachers in infant schools could co-operate with the librarian in making known to their children the fact that books of this kind were in the library. It would be an easy matter for the librarian not merely to supply the schools with written particulars, but to arrange that any teacher on application could have some preference in the matter of loaning her certain picture-books. These she could bring before the notice of her young charges by reading the stories to them, and showing them the pictures, at the same time telling them that if they wanted to have them at home they could get them by asking their older brothers, or sisters, or parents, as the case may be, to borrow them from the library. This would appear to be the only practicable method of bringing the youngest children of the schools into connection with the library, and it constitutes the exception to the rule pleaded for in the earlier part of this article, that the library and not the school should be the meeting-place of the children with the books. The reason for this is that it would not be convenient to have very young children on the library premises, having regard to the state of English library organisation and staffing. The case in America is altogether different, and it is the practice there to entice the children into the library not long after they are able to walk, and there entertain them in rooms specially set apart with pictures, books, models, toys, etc.; while in one corner a specially-trained lady children's librarian sits on the floor surrounded by children and tells stories.

To the English mind there is something ludicrous in the idea of what ought to be an agency for the engendering and propagation of the love of books becoming a public nursery. There are two reasons for concluding that such a state of affairs will never obtain in English libraries. The first is that which has been already indicated—namely, the absence of any inclination on the part of library authorities to overdo the work in connection with children; and the second, the impossibility of doing so, even did the inclination exist, owing to the incomes of libraries being approximately only one-fourth of those yielded by the more liberal rate levied in America for library purposes.

The Americans continue the same policy with regard to children above the very young stage, attempting, willy-nilly it is to be feared, to inculcate a love of literature. Whether this result would follow such methods cannot but be seriously doubted by those who believe that taste for good reading is three parts innate; and that it does so follow is emphatically denied by experts who have had the opportunity of comparing American with English methods and the English child with the American. In English libraries the child is regarded as not so much the citizen in training as the citizen in miniature. And it is because of this conception, among other reasons, that the present writer thinks that he or she should be encouraged to come to the library instead of having the library taken piecemeal to the schools, and the securing of the books made a piece of ordinary school routine.

The books forming the juvenile department in the public library constitute at the present day a widely different collection to that commonly found in the early days of the library movement, when, even where a special collection were thought necessary, books of the crudest and most namby-pamby type were considered good enough for the purpose. Things are very different now, and it is not thought sufficient to provide fiction only. Necessarily there is a preponderance of story-books, but they are selected with the utmost care, not only as regards matter, but also as to appearance, the most attractive, well-printed, and faithfully-illustrated editions being purchased. In addition to these are books on all manner of subjects specially written for juveniles.

The writer can vouch, on long experience, for the popularity of such works. He has been much struck by the way in which books on natural history, nature study, pure and applied science, history, drawing, and painting are sought after by the children. Books of poetry, too, such as Palgrave's *Children's Treasury*, Charles and Mary Lamb's *Poetry for Children*, Whittier's *Child Life*, Kenyon's *Brownings for the Young*, Canon Ainger's *Tennyson for the Young*, etc., are equally as popular; while many of the children go quite beyond the juvenile section proper, and borrow books of a more advanced character from the general library.

So much, then, for the books themselves; now as to the details of administration of the department. A separate issue counter ought to be, and nearly always is, provided for juveniles, with closely adjoining open bookcase for the exhibition of the best and latest additions. A juvenile reading-room is also essential to the obtaining of good results. This must be made bright and cheerful, and freely ornamented with good reproductions of famous pictures, especially those of a classical or historical significance, likely to arouse the curiosity of the children to the extent of sending them to their books for explanations, or, conversely, of affording them the exquisite pleasure, common to young and old, of beholding beautifully depicted some personage or incident made dear to them by memories of former reading.

A terrestrial globe might with advantage stand on the floor of the room, while on the tables would be placed the best juvenile magazines, of which, if those general publications devoted to the arts and crafts

are included, there is a fair number. As much freedom as ever possible must be allowed to the children in the matter of their behaviour in this reading-room. They must not be required to maintain an unnatural stillness and quiet; and, indeed, it has been found that they become so interested in their magazines and books as never really to become unruly.

The most important feature of the juvenile department is undoubtedly the catalogue, and nothing which is done in the interests of the children is so much appreciated by them as when it is exclusively devoted to the books in their department. It should contain all the information that portability and finance will permit. Its form in different libraries will vary according to system in vogue between the dictionary and classified; but whichever is adopted, concise annotations should be supplied. These from an experienced hand are most useful in affording guidance in the use of informative works, and in suggesting the character, without, however, disclosing the plot, of those which are imaginative. Some libraries have printed chronological lists of historical tales, publications which must be of great use to children dealing systematically with this form of literature. The funds, however, of most libraries would not allow of this extra expense in their printing bills. Having in view the fact of the acknowledged utility of such lists, it has often seemed strange to the writer that the cost of their production should not be considered a legitimate item of expenditure to education committees, especially when headmasters, of secondary schools in particular, have asked for their publication. Librarians would be delighted to find time for the work under such conditions.

Finally, then, it has been seen that the library and the school will best help each other by not being too closely related, the former having always on its premises a juvenile collection instead of allowing it to be hawked about the town in totally unsymmetrical batches; while the function of the latter should be to advertise during school hours and at appropriate lessons the resources of the library, to encourage the borrowing of the books by the children and their attendance in the reading-room, to suggest through the teachers to the library authority the purchase of suitable books, and to help in many other ways, of which the teachers will know best. There is a greater chance of the relationship suggested converting juveniles into permanent readers at the library when they reach a maturer age than if they only knew of the library through the proxy of the school, and this continuity is of all things the most desirable.

CHERWELL HALL, OXFORD.—Twenty-nine candidates took an examination for a Secondary Teaching Diploma from Cherwell Hall during the year 1906–7, with the following results: eighteen obtained the Cambridge Teachers' Diploma, nine the Oxford Teachers' Diploma, and one the London Teaching Diploma. Among the students of the year were Miss Allen, the headmistress of the Girls' High School, Uganda, and Miss Mackenzie, M.A., and Miss Newland of Bombay University. The other students included representatives from the Universities of Oxford, Cambridge, London, Manchester, and Wales. Two students were prepared for the Archbishop's Diploma to teach theology in addition to their training work, and several attended the lectures at the school of geography with the intention of obtaining a certificate or diploma in geography under Dr. Herbertson. Scholarships of £10 and £20 will be awarded to students entering Cherwell Hall in October 1907 and January 1908. The principal of Cherwell Hall is our esteemed contributor, Miss Catherine I. Dodd, M.A.

YOUTHS AND MAIDENS IN ART.

BY HAROLD ARMITAGE,
Author of "A Life of Greuze," etc.

III.

JUST as the renowned artists of the Netherlands have given us both the children of peers and the children of peasants, so was it also in Spain during the same period, when Velazquez and Murillo were the principal painters. Each is like the other in standing high in the world's regard, but considered as painters of youths and maidens they interest us by widely different means; for while the name of Velazquez, like the name of another court painter, Van Dyck, is associated with paintings of the children of a king and of his nobles, Murillo is still to us, notwithstanding his altar-pieces and other religious pictures, a painter of flower girls and of beggar boys.

We have seen in what relation Van Dyck stood to Charles the First, and it was a similar bond that united Velazquez to Philip the Fourth of Spain; and precisely as Van Dyck found opportunities, when he was not painting any of his numerous portraits of Charles, to paint the king's children from time to time, so also have we many pictures of the sons and daughters of Philip the Fourth by Velazquez. Indeed, it fell to his lot to paint those portraits of the Princess Maria Theresa that were carried round to the courts of Europe in the marriage negotiations of the time; and it is a sequel in keeping with such bagman's methods of arranging a betrothal that this unfortunate princess married Louis the Fourteenth of France, and lived a life of isolation and of misery at the scandalous French court.

As Velazquez had two daughters of his own, it was to be expected that he would paint sympathetic portraits of girls, and it happens that one of his masterpieces is a portrait of the little Princess Margarita Maria when she was four or five years old, surrounded by her maids of honour; and the king, her father, who gave Velazquez generous emolument and many honours—pudding as well as praise—was delighted with this picture. At court the Infanta Margarita Maria was a favourite. Her blond beauty, blue eyes, and light hair gave her distinction amongst the swarthy Spaniards, and Velazquez painted her often, and that too with more than merely technical skill, giving us charming pictures, which have ever since been the delight and the despair of artists. One particularly, the portrait in the Louvre, has proved most alluring to art students, and Velazquez himself seems to have painted it more than once, for the copy in the Wallace Gallery is attributed to the artist himself.

Naturally, also, much attention was bestowed by Velazquez upon the son of Philip the Fourth, little Don Balthazar Carlos. He was painted as a baby, and frequently afterwards, sometimes in hunting dress, accompanied by his dogs, and in others galloping upon a pony that is not in the painter's best style, seeing that it suggests rather the rocking-horse of the nursery than the pony of the mountains. In the famous portrait in which the Prince of Asturias rides upon his pony he is about seven years of age, and the original painting is at Madrid; but a copy, smaller in size, ascribed to Velazquez, with a landscape background which lacks some of the details of the picture in Madrid, may be seen in the Dulwich Gallery. It may be, however, that in the Dulwich picture the figure of the

prince only is by Velazquez, and that the remaining parts of the picture have been painted by pupils. This prince never came to the throne, for at seventeen years of age he died of smallpox.

Partly because these portraits are so well known already, and partly because in the case of the princesses the fashion of the day in dress was so hideous, conventional, and perverse in every way that Velazquez labours under an injustice in having had to burden his work for all time with its uncompromising ugliness, we have given instead of these royal children Velazquez's portrait of a nameless little girl, from the collection of Mr. Arthur Sanderson.

At one time this picture, which came from the sale of Sir William Knighton, was regarded as still another portrait of the Princess Margarita Maria; but against this view it has been urged that the princess had light hair and blue eyes, and that the child in this picture

LITTLE SPANISH GIRL.
(*Painting by Velazquez.*)

has dark hair, black eyes, and a golden-brown complexion. Moreover, all is simple and free from extraneous ornament, so that it is probable that the little girl, so far from being of the royal house, was not even the daughter of an aristocrat. The late Cosmo Monkhouse considered there were good reasons for believing the picture to be a portrait of one of Velazquez's little grandchildren. The painter had not finished the bust, but the head is completed with all the facility and skill with which he had been so marvellously endowed, and so we have once more the beauty and simplicity of childhood rendered by a supreme master of the art of painting.

The qualifications which Velazquez brought to the painting of children were many and unusual. He painted what was before him with powers that seemed never to desert him, for few have ever attained such mastery of his materials as Velazquez had, and it ought to be added that few have worked with such unflagging industry to acquire that mastery. Although he had been under teachers, he appears to have owed little to them; but, as the way of genius is, he went his own way, and rapidly outstripped those who sought to give him instruction.

In Spain during many years art had been dominated by the Inquisition with its Inspector of Sacred Pictures; but meddlesome as was the Inquisition, it paid no heed to portraits, confining its interference to the painting of miracles, martyrdoms, and altar-pieces. Thus in portraits an artist had more freedom, and it is in this branch of his art that Velazquez, rendered independent of the priests by the patronage of the king, has achieved such excellence; and yet his work is so simple, so entirely free from mannerisms, that one is apt to think it might be accomplished by any one, though the fact that so few in the history of the world have ever attained such unerring skill, such reality, such force, may very well set one thinking. "What we are all attempting to do with great labour, Velazquez does at once," said Sir Joshua Reynolds; and Ruskin has written that Velazquez "had precisely the same intense perfection of truth, the same marvellous instinct for the rendering of all natural soul and all natural form that our Reynolds had."

In the case of Velazquez England is once more fortunate, for in this country many excellent examples of his work may be seen, though naturally Madrid is the city in which he may best be studied. Then comes the Imperial Gallery in Vienna; and bearing upon the particular subject of these articles are four examples of Velazquez at the Wallace Gallery. It is strange in the case of a painter of such eminence that there should have followed a generation who knew nothing of Velazquez, and it may be said that he was rediscovered at the beginning of the nineteenth century.

Not much is known of the life of Velazquez. He was born in Seville in 1599, and he died in 1660 in Madrid, where he was buried with great pomp and circumstance. Seven days later his wife followed him to the grave. For forty years he was court painter, and a royal favourite; and in 1623 he came into touch with this country by painting a portrait of the Prince of Wales, afterwards Charles the First, when the prince was wooing in Madrid.

What we know about Velazquez is to his credit, and during the time that he was basking in the sunshine of the court at Madrid there came to him from his native town of Seville one Murillo, a penniless, friendless, fatherless and motherless young man, the son of a mechanic, who had tramped all the way over the Sierras, a very long and particularly difficult journey.

It shows that success and the chilling etiquette of the Spanish court had not frozen the generous warmth of Velazquez's heart, for in the midst of all his splendour he befriended his shabby and impecunious young townsman, and spared no effort to advance him then and thereafter. Cean Bermudez, his countryman, has told us that "when Murillo arrived in Madrid he went to visit his countryman, Don Diego Velazquez de Silva, first painter of the Camara to the king, with whom he was not acquainted but by his fame, and he requested of him letters of recommendation to Rome. Velazquez, pleased with his appearance and mild disposition, asked him various questions about his connections and his family, of his school and his master, and concerning the motives which had induced him to leave his country and undertake so distant a journey.

A Spanish Peasant Boy.
(*Painting by Murillo.*)

To all which Murillo replied with so much candour that Velazquez, captivated with his spirit and ingenuousness, told him that henceforward he must continue under his roof, where he should be attended like a friend and like a countryman."

Having spent three years at Madrid copying pictures, and engaging in other forms of art study under the protection of Velazquez, Murillo returned to Seville, became a successful painter of religious pictures, married a lady of fortune, and founded an academy for art students, so that poor artists of the place might not lack for instruction in their own town. But beautiful and interesting as are Murillo's religious pictures, the justification for his introduction into this article as a painter of youths and maidens comes from his innumerable peasant boys and flower girls; and in this kind of painting Murillo may be regarded as a pioneer. A man of kind and gentle disposition, Murillo painted children with obvious delight. He had been a poor orphan lad himself, and in his early art days, before he went to Madrid, he used to attend a market in one of the squares in Seville. Here were offered for sale, as in many an English town on Saturday nights, vegetables, crockery, meat, fish, fruit, cast-off clothing, old iron, books, and other temporalities; but in this collection of out-door stalls there was another element, not to be seen at our open-air markets, for artists themselves attended with their own pictures. It is evident that even the artistic temperament has become more sophisticated since Murillo's days; for though these gatherings of buyers and sellers have survived in most towns, and include generally a few book-stalls, they lack what would be a most interesting feature—a number of artists and their works.

By this humble means, and by painting sacred pictures to meet the demands of Spanish South America, Murillo managed to hoard the little money which was spent during his journey to Madrid—a journey which ended, as we have seen, in a meeting with Velazquez.

While Murillo had loitered about in Seville on market days, waiting for buyers, he had many opportunities to watch the ragamuffins, who, as is their habit all the world over, are attracted by the pickings that are possible in an open-air mart, with its chances of a battered apple, a half-decayed orange, or other prize—and sound fruit too, occasionally, if sufficient dexterity can be shown at the right moment. It is these tatterdemalions of the market-place and the inevitable dog that Murillo has given us with thorough mastery and understanding.

There is a fallacy which obtains in the minds of most people that the children of the streets are necessarily unhappy; but it is only in books that the girls and boys of mean thoroughfares sit upon doorsteps to whine and brood over their poverty. Many children who are coddled in the houses of the well-to-do, and who have been rendered *blasé* by a ridiculous plethora of toys and other attentions, are less happy than the alert young gutter-snipe who has retained the native power of

> "Turning to mirth all things of earth,
> As only boyhood can."

There are no morbid children amongst Murillo's little vagabonds. Vivacious and mischievous as monkeys, bronzed with the sun and air, irresponsible and happy, they revel in a freedom unknown to the boys of our time, hedged about with school attendance officers and a less genial climate. In Murillo's pictures

The Laughing Boy.
(*Painting by Murillo.*)

we see them playing games, or lurking in some corner to enjoy great store of luscious fruit—grapes or a melon—which they may or may not have come by honestly. They are dirty, neglected, even verminous, as Murillo somewhat ostentatiously tells us sometimes, and they are ragged; but, somehow, they are happy and good-humoured, like the *gamins* of real life, taking no thought for the morrow, living the vivid life of the present in healthy disregard of the past and of the future. Generally these mud-larks are accompanied by the kind of dog that does accompany such riff-raff in real life, and the spirit of good fellowship seems natural and complete.

Murillo's last picture was an altar-piece in Cadiz; but this work he could not complete, for, falling from the scaffold, he was compelled to return to Seville, where he died on April 3, 1682. He left two sons and a daughter; but the daughter he had already lost, for, deeply religious like her father, she had taken the veil eight years before. All that is known of Murillo is pleasing. He was a great artist, and he was a good and kind man.

(*To be continued.*)

PAGEANTRY AT OXFORD AND BURY.

BY FANNY JOHNSON, FORMERLY HEAD-MISTRESS OF THE BOLTON HIGH SCHOOL.

"A PAGEANT is a lofty and dignified representation of the story of a town or village in dramatic form. It is acted by the citizens themselves, their wives, their children, and their friends. *It is a great act of thanksgiving for the mercies of the past*, and it ought to commence each day with a solemn offering of divine worship, and be continued on the pageant ground by the acting of scenes which recall the historic past." Thus Mr. Louis Napoleon Parker, its "onlie begetter," defines the modern pageant. The well-informed reader is, of course, aware that the accepted definition of the word, before the great "Louis Napoleon" put his seal upon it, was merely a "play performed upon a movable stage," the meaning being derived from the scaffold or stage (Low Latin, *pagina*) upon which the mediæval pageants were enacted. But inasmuch as these street plays, performed in small compass for the convenience of speedy removal from place to place, depended for their attraction rather upon the "dressing-up" than the purely dramatic element, the word acquired a secondary significance of ostentatious display, or, to express it contemptuously, "mere show."

So the word pageant and the thing alike suffered eclipse for many a century indeed in England. And now, in this year of grace 1907, at least half a dozen "shows" of the type indicated by Mr. Parker in the above quotation have taken place in various parts of the country. I propose to speak here of the importance and influence of this "pageant movement" in education, setting aside for the moment the value of the plays themselves as literary or dramatic compositions. For whatever may be the ultimate verdict concerning the pageants of the present year in that regard, there can be no question that in the future history of education Mr. Parker's name will be handed down as a great inventor of a new form of popular entertainment, and hence as having influenced, in however small a degree, popular morals.

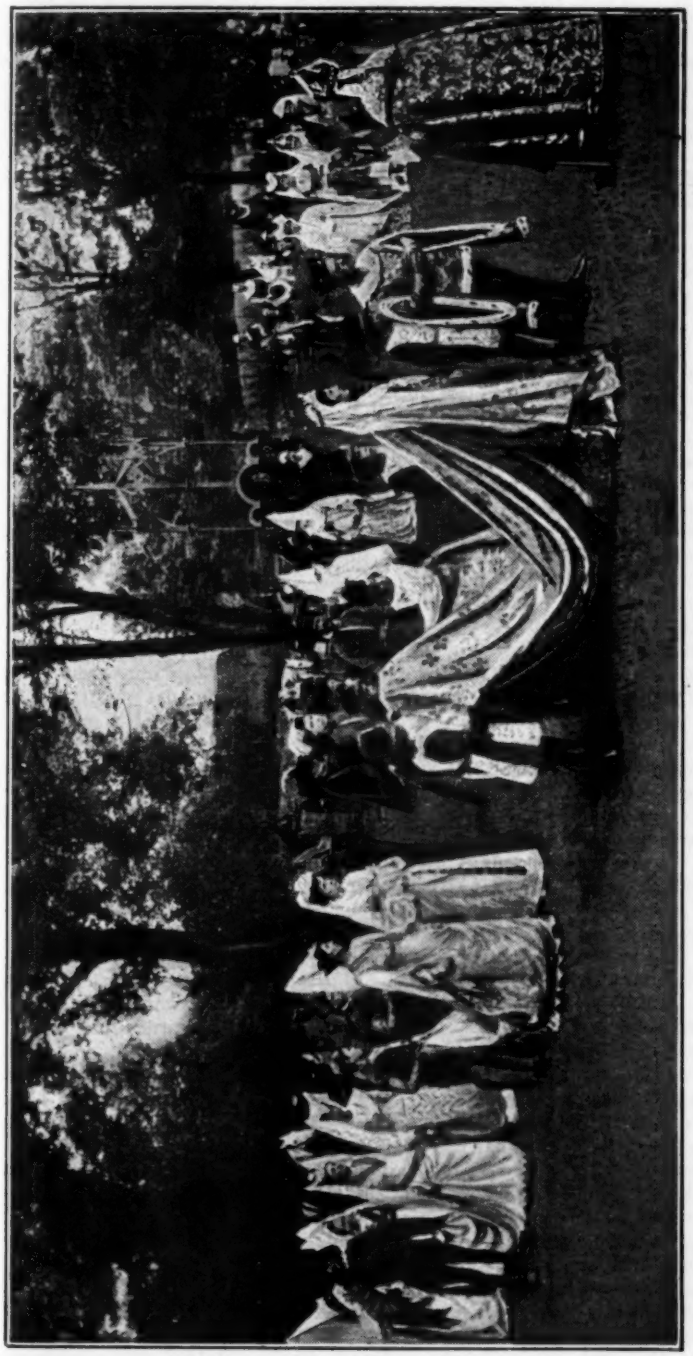
We see how seriously, as is the manner of inventors, he himself regards his creation. And wherever his personal influence has extended, this high ideal has certainly been kept well in view. Pageants under his direction have been great "acts of thanksgiving," and a good deal more besides. For Mr. Parker is anything but a solemn person himself. His genial humour and unaffected sympathy with the people make him personally popular, and able to surmount the enormous labour that is associated with the preparation of a pageant after his own heart. And the same qualities of sympathetic understanding are apparent in the "books" or librettos for which he has been personally responsible. Lest this paper should degenerate into a mere panegyric, let me say that after seeing the Warwick Play last year I had no little misgiving lest the pageant should become a merely stereotyped form, upon which heterogeneous piles of clothes would be stuck, and lest rapid degeneration should ensue, so that the last state of pageants would be worse than the first. The danger of such conventional show has been avoided so far, and may, with good luck, be averted indefinitely.

This particular craze, which superior persons are apt to smile at, is only one symptom of the love of colour and gaiety that is slowly but surely penetrating throughout all ranks of society, and making our country once more almost deserve its old title of Merrie—that is, pleasant—England. In the towns we see even the lowest class flocking to music-halls and becoming discriminators of dramatic talent.* And the Churches themselves—nay, the schools—are forced into competition, or, more wisely, themselves take the initiative, with rival attractions of a more or less dramatic character. This strange passion for pretending, which is the most universal of all æsthetic impulses—unless we except the passion for building—is now no longer ignored by those who aspire to lead, nor suppressed by those who have to govern. Can we trace it partly, perhaps, to the feminist movement which is pervading modern times—the love of acting being, perhaps, a peculiarly feminine, while the love of building is possibly a masculine instinct? However this may be, educators, male and female, are at one in permitting, and more often than not, in encouraging, acting among their pupils. School entertainments, like other theatrical displays, may, of course, be carried out not wisely but too ill. And the Pleasant Sunday Afternoons and similar attractions of the Churches may, under inferior management, be not much more improving than the secular amusements they are designed to replace.

But the main point has been gained; the stage is now recognised as a field for serious workers of all kinds, or, in the conventional phrase, as an immense power for good as well as for evil. Hitherto classical drama—English, Greek, and occasionally French, German, or Latin—has been the stock school method of imparting reality to literary or language instruction. Dull pupils have been deliberately enticed along the path of culture by the rendering of a play of Shakespeare, of Euripides, or of Molière, in their own persons or those of their schoolfellows. And the learning of the text by heart from end to end has been proved

* This is our contributor's personal view, which we commend for its optimism.—Ed.

by such experience to be more fruitful of result, even from the examiner's point of view, than the learning by heart of "notes" to English classics that was too much in vogue a quarter of a century ago. Attempts have been made, too, to add history to literature as a school subject that may with profit be treated dramatically. And at this point Mr. Parker steps in with the Pageant, which, educationally considered, is a huge history lesson.



ENTER QUEEN ELIZABETH. (A SCENE FROM THE PAGEANT AT BURY.)

It is one of life's ironies that the summer of this present year, with its immoderate plague of rains and waters, should have coincided with the great revival of Pageantry, which depends for so much of its charm upon the Great Out-of-doors. But—I chronicle it with peculiar personal thankfulness—the courage of the propagators, who disregarded the threatening of elements, was amply justified in my own experience of the two great folk-plays at Oxford and Bury of which I write. In each case the very uncertainty of the gray-looking afternoon added a new dramatic thrill to the performance. And certain apposite gleams of sunshine at critical moments upon the masses of white, crimson, or black garments that were grouped upon glorious green backgrounds (so freshly green had the late season, with all its drawbacks, preserved them) stand out as sensations never to be forgotten.

Adverse winds, however, may be even worse foes to pageant effects than clouds and rain, for the strongest voice carries no better than the weakest against the wind. It is part of Mr. Parker's unerring instinct, joined, no doubt, to previous experience, that the speeches in his books for the most part consist of not more than two or three lines in length. Thus many performers are enabled to take part, whose memories may be too short, or leisure too scanty, to admit of their learning lengthy speeches, while their sense of importance is gratified by a speaking *rôle*. With infinite tact the Master of the Pageant at Bury summoned his performers to rehearsal by a printed placard, stating that "no single part is unimportant," and that the success of the performance may be made or marred by the absence or presence of a single individual. The open-air speech is, in any case, a test of voice production, from which male performers of course come off easily best. Historical personages are, fortunately for pageant purpose, apt to be chiefly male. And the ladies—of whom Queen Elizabeth is usually one of the most prominent figures—atone by the splendour of their garments for the comparative shrillness of their utterance. Herein we perceive again the philosophy of clothes.

Historical spectacle of this kind would be nothing if it did not involve approximately correct costume. At Oxford more particularly, nothing could have been more striking than the impression one got of the tone, so to speak, or atmosphere, of any particular period from its prevailing costume. A friend of mine was almost persuaded, for instance, for the first time to be a Royalist by the grace and dignity of the groups in the "Charles I." Episodes. A single portrait of Van Dyck conveys,

indeed, the grace and charm of that period, but one ascribes the impression in part at least to the painter. But when a group of persons are seen dressed in the costume of a dignified age in such numbers that the age itself, and not only a single individual of a favoured type, seems to appear in its habit as it lived, an object lesson is conveyed of the influence of clothes, not perhaps upon morals, but surely upon manners. No Cavalier of Charles the First, for instance, could have doffed his plumed hat to a lady with the scant *appearance* of courtesy that is permitted to the modern top-hatted gentleman. And a Henrietta-Maria-clad lady could hardly have failed to be graceful of movement in the lovely folds to which her beautifully-designed skirt lends itself. The Oxford Royalists, carrying on the tradition of the place, certainly contrived to give the effect of being more to the manner born than most of the groups in the other Episodes.

A pageant, then, necessarily tends to become an exhibition mainly of historical costume. Several of the Episodes at Oxford were, in fact, merely processions of groups in the dress of a given period, without any pretence of speaking or even acting in dumb show. The attention of the spectator being thus undistracted by the strain of listening to imperfectly heard words, the imaginative effect was sometimes the stronger. On the other hand, defects in the organisation and drill of the performers became more glaring. It was difficult, for instance, to turn away one's eyes from a gentleman in Elizabethan costume—down to the waist! —who had forgotten to exchange his modern nether garments for the customary Elizabethan hose.

Not much is gained, however, educationally by the individual who is put for once in his life into unfamiliar garments, provided for him by a paid costumier. And at Oxford, I understood, the clothes were obtained to a large extent by hiring. At Bury, on the other hand, some hundreds of ladies had been working for nearly a year at the designing, cutting out, and actual making of the costumes; while a bevy of some forty men, many of whom belonged to the artisan or shopkeeping class, had spent their leisure times during the same period in the manufacture of properties.

This is Mr. Parker's way. It is evident that the value of the pageant is not only enhanced but absolutely transformed by such a system. The impulse thereby given to local ingenuity and the discovery of local talent, as well as the stimulation of local interest, and of all, in fact, that makes it what the founder calls "a great act," is quite incalculable. Even the sum of human knowledge may be thereby increased, for in the search for correct detail those already learned in such matters, who must, of course, be leaders in the work, will doubtless find their scholarship confirmed or modified by the fresh enthusiasm of workers new to the field. In any further development of the pageant habit, it is to be hoped that the local leaders will insist on securing local workers before embarking on an enterprise which, if carried out in a merely commercial spirit, or with a view to quieting the populace with *panem et circenses*, can only end in degeneration and vulgarity. Artists have for years been endeavouring to arouse the conscience of the people to the beauty of "work" rather than insisting on the dignity of "labour." It seems possible that Pageantry, conceived in the proper spirit, might do something to solve the complex problem of unemployment!

I was fortunate in coming early to Bury while a partial rehearsal of the St. Edmund Episode was in progress. The players were loutish-looking boys and men in workman or artisan clothes. They were drilling, under Mr. Parker's guidance, for the afternoon performance with the utmost seriousness and interest, in a scene in which their duty was chiefly to "roar horribly" as the murderers of the saint. No great educational value in this, you may say. But had those boys and men ever before, think you, conceived themselves as members of any body more enlightened or embracing than a trades union, or (say) at the best, some Band of Hope, or church or chapel society, designed for the benefit of their own class? The workingman may have learnt that it is his duty to serve the Empire, or to serve his country, by being prepared to *die* for it. Few working-men, I imagine, have hitherto conceived it possible to serve their town and neighbourhood, in altruistic sense, by *living* for it, and by forming a part of its dignified spectacle. And such local patriotism needs stimulating in others besides the working classes.

Oxford, alas, did not altogether control the usual tendency of cleavage between town and gown. Theoretically, all classes worked together. But practically some episodes were managed by townspeople, and some by members of the University. In fact, there was a markedly more cultured, and at the same time less disciplined, air about the Oxford performance. Such individuality and variety in pageants is not to be deprecated. As I hinted above, the management of every such show by the same controller would certainly tend to a fixed, and in the end a monotonous, type of performance. The *genius loci* must be evoked and preserved by every possible means. Bury might have learnt from Oxford a certain fluidity of detail, while Oxford would have been the better for a little of Bury's precision. The writing of different Episodes by different hands, and the rehearsal and arrangement of each Episode by a different leader at Oxford, made for pleasing variety and surprise. I was reminded by the two plays of two types of head-master or head-mistress. One has his eye everywhere, lets nothing escape him, is instant in season and out, vigilant, capable, punctilious, autocratic, and highly impressive to H.M. Inspector; the other, a little sluggish of temperament, chooses his assistants once for all, trusts them to carry out their duties, is inobservant of detail, lets the dust, moral and material, in corners lie, but is genial and good-tempered, and universally beloved. Boys and masters return to the school in after years with affection, and feel that *they*, and not the head only, have made the school. Each type has its own peculiar merit.

Mr. Parker contrives to combine something of each. But the beauty of the Oxford Pageant was due to something more intangible than a master mind. It was in part the result of centuries, and not merely of a few months' preparation. A pageant should be, indeed, part of the whole dramatic life of the people. Little Bury has had her day, and has certainly not ceased to be; but her kingship of East Anglia has merged into a larger whole. Oxford still aspires to the leadership of nations in the inner life of thought. The history enacted in its pageant was, in the main, the history of the triumph of the human spirit, from the legend of St. Frideswide to the sturdy opposition of the Fellows of Magdalen to the tyrant king.

The Modern World

CURRENT EVENTS CONNECTED WITH SCHOOL WORK.

GEOGRAPHY NOTES UP-TO-DATE.

BY E. R. WETHEY, M.A., F.R.G.S.

Erosion and Accretion of Land on East Coast of England.

AT a recent meeting of the Royal Commission on Coast Erosion it was plainly shown that, though every year in many places there is a more or less large loss of foreshore, there is, on the other hand, a steady gain of land everywhere. In England and Wales alone the total loss or gain of land during the past twenty or twenty-five years is estimated as the difference between a gain of 31,171 acres and a loss of 419 acres—that is, a net gain of 30,752 acres. This must go far to compensate for the undoubted loss of foreshore which is especially noticeable in some parts of the east coast of England, notably the Holderness district of Yorkshire and the coasts of Norfolk and Suffolk. At all events, it would appear that the popular notion that we are being washed into the sea at the rate of 2,000 acres a year requires qualification.

We of this generation, of course, see little difference year by year. Still there is no doubt whatever that the British coast-line of Cæsar's time was different from ours of to-day. To go still further back—say four thousand years ago—when the sea stood about sixty feet below its present level, the difference must have been more striking still. It is about then that a subsidence of the land, or a rise of the sea (geologists are not clear which), took place. This was naturally followed by the disappearance of many wide coastal plains, like the plain still existing for many miles west of Brighton. It is after this period—say three thousand to three thousand five hundred years ago—that the modern samples of erosion and accretion began. The whole subject is a large one. We propose in this article to examine the east coast only. For the figures we are chiefly indebted to various publications of Mr. E. R. Matthews, the borough engineer of Bridlington, whose researches into the subject are well known.

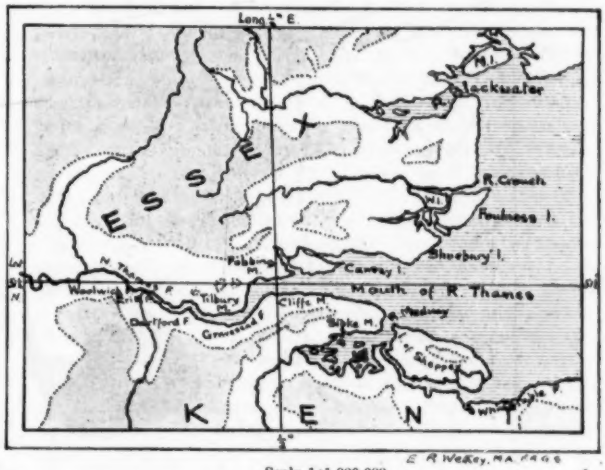
The map shows roughly the interesting points in this alternate loss and gain in man's fight with the sea. It comprises practically the whole of the coast from the Farne Islands off Northumberland to the northern portion of Romney Marsh in Kent, just short of Dungeness. It includes amongst the gains both those which are due to natural accretion, as at Spurn, and those which are largely the result of reclamation, as round the Wash.

The notable features are :—

(1.) There are only three places where little or no alteration is taking place—namely (*a*) from the Tweed to the Tyne, (*b*) South Durham, (*c*) Lincolnshire. Of these (*a*) and (*b*) are for the most part rocky, while (*c*) consists of boulder clay and alluvial deposits, protected by sand dunes and marram grass.

(2.) An immense gain has taken place in the Fen districts of the Wash. No less than 10,000 square miles of good agricultural land have taken the place of the water-logged marshes, which some geographies would have us even now believe is the normal condition of Fenland.

(3.) Other enormous gains are apparent round the mouth of the Thames and farther south over Romney Marsh. The small sketch map shows in detail the chief reclamations of land round the Thames. These include a large portion of the unshaded area along the coast and up the rivers. The names locate the chief reclamations in four sections—(*a*) the Blackwater islands and lowlands ; (*b*) the Crouch marshes and islands ; (*c*) the marshes and flats on the north bank of the Thames ; (*d*) the marshes and flats on the south bank of the Thames.



Scale 1:1,000,000.

0 5 10 15 20 25

English miles.

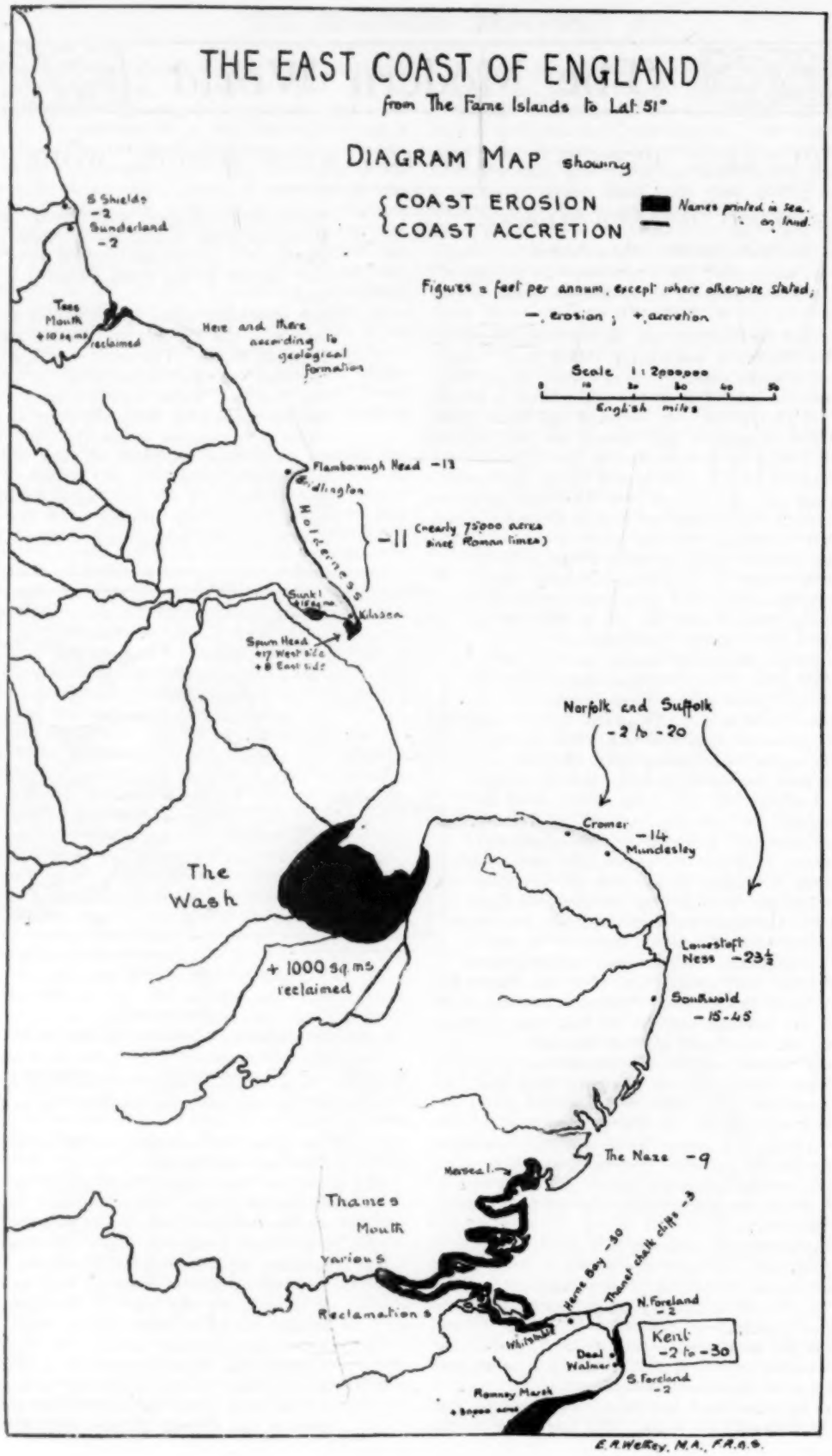
Chief Reclamations of Land round the Mouth of the Thames.

M = Marsh. F = Flats. M.I. = Mersea Island. W.I. = Wallasea Island. Land 100 feet and more above sea-level.

The principal reclamations are in the unshaded area, and are indicated by name.

(4.) Minor gains are noticeable at the mouths of the Tees and the Humber.

(5.) There are three areas of loss:—(*a*) Nearly all the Yorkshire coast, especially that part of it which stretches from Bridlington to Kilnsea. The exact total lost since the time of the Romans is, according to Mr. Matthews' estimate (*Geographical Journal*, vol. xxviii., No. 5, p. 492), no less than 73,780 acres, or 115 square miles, an area almost equal to that upon which London stands. (*b*) The coast of Norfolk and Suffolk round from Hunstanton to the Naze, as to which the various figures on the map speak volumes. Two miles have gone in the Cromer district since the Roman


THE EAST COAST OF ENGLAND
from The Farne Islands to Lat. 51°
DIAGRAM MAP showing
COAST EROSION
COAST ACCRETION
Names printed in sea.
" on land.
Figures = feet per annum, except where otherwise stated;
—, erosion; +, accretion
Scale 1 : 2,000,000
English miles
S. Shields -2
Sunderland -2
Tees Mouth +10 sq ms reclaimed
Here and there according to geological formation
Flamborough Head -13
Holderness
-11 (nearly 75,000 acres since Roman times)
Kilnsea
Spurn Head -17 West side +8 East side
Norfolk and Suffolk -2 to -20
Cromer -14
Mundesley
The Wash
+ 1000 sq ms reclaimed
Lowestoft Ness -23½
Southwold -15-45
The Naze -9
Harwich
Thames Mouth various Reclamations
Herne Bay -30
Thanet chalk cliffs -3
N. Foreland -2
Kent -2 to -30
Deal
Walmer
S. Foreland -2
Romney Marsh +3000 acres
E. R. Wellcy, M.A., F.R.G.S.

period. (c) The north-east corner of the Kentish coast.

(6.) The prominent headlands are receding: Lowestoft Ness heads the retreat at the astonishing rate of twenty-three and a half feet per annum; the Naze, Flamborough Head, and the two Forelands follow at a much more respectable pace, from nine feet to two feet.

Some Famous Examples of Gain and Loss.

Some of the most notable "gains" are worth recalling. The history of Sunk "Island" (Humber mouth) is as follows:—

1650.....An island a mile and a half from the Yorkshire coast, with a navigable channel right round it.
1660.....Two sandbanks, with channel in between.
1684.....Seven acres enclosed.
1712.....Growing better barley and oats than any other place in Yorkshire (Leland), as well as a small quantity of woad.
1744.....1,561 acres enclosed and rendered valuable by warping.*
1833.....6,000 acres enclosed (7,000 by 1850).
1907.....Nearly 10,000 acres—say 15 square miles—enclosed; in other words, this formerly insignificant island, a mere deposit of sand and silt in the Humber estuary, is now joined to the mainland, and boasts a parish with a church, a harbour, and a fixed population making a livelihood out of agriculture.

The decline of the Cinque Ports is an old story. Formerly their ships created the nucleus of the British navy. Now only one of them, Dover, has a port at all. Sandwich is two miles from the sea; Romney one; Hythe has a bank of shingle, a mile in width, between it and the sea. Sandwich reminds us of another gain in the north-east corner of Kent. In its heyday it stood as guard to the entrance of the Wansum Channel, a stretch of water which, 500 yards to 600 yards wide in Bede's time, separated Thanet from the mainland, and provided ships with a means of avoiding the dreaded North Foreland on their way to London. Of this channel hardly a vestige now remains.

But the greatest of all the "accretions" has been the reclamation of the Fenland round the Wash, that great, shallow basin which, excavated by the action of the sea, after it had burst through the chalk barrier which connected Norfolk with the Lincolnshire Wolds, was filled in subsequently with deposits of silt and gravel brought down by the rivers. The work has taken nearly two thousand years to bring up to its present condition, and has been done bit by bit. The Romans began it when they dug out the Caer Dyke from Ramsey, or Cambridge, to the Witham at Lincoln. Spasmodic attempts at further progress were made by mediæval monks round their various monasteries right up to Reformation times. But it was not till the seventeenth century and the advent of Dutchmen of the type of Cornelius Vermuyden that any great works were undertaken. The greatest of all these was the famous "Bedford Level," which reclaimed the fens of the Nen and Great Ouse. The Civil War and Cromwell's own antipathy to interference with Fenmen's rights put off improvements another century, nor was much more done until the Witham drainage schemes were executed in the early years of the nineteenth century.

Per contra the "losses" by erosion are equally famous, and nowhere more so than along the Holderness coast of Yorkshire. Scores of villages and at least one important town have been swept away, and nought but their names remain. Ravenspurn sent a member up to Parliament in Edward the First's time; as a seaport it welcomed Henry of Lancaster in 1399 when he landed to claim his crown; and nearly a hundred years later, Edward the Fourth, when he returned from his short Dutch exile. Ravenspurn now lies fathoms deep in the North Sea somewhere just to the north of Spurn, and all that remains of it is the old cross which was erected to commemorate Henry the Fourth's landing, and which is now standing in Hedon town. One of the last villages to disappear, says Sheppard in his *Geological Rambles in East Yorkshire*, was Owthorne (near Withernsea). It boasted a church and twelve houses at least as late as 1822, the date of the old Ordnance Survey. Six years later all had gone save one tombstone in the churchyard. Now there is trace neither of village nor of churchyard. The same author gives an up-to-date example of this steady advance of the sea. At Kilnsea the Blue Bell Inn was built in 1847, and "according to an inscribed stone built in the wall, it was then 534 yards from the cliff. In 1876 it was only 392 yards away, and at the present time the distance between the cliff and the inn is still less." And this is *modern* Kilnsea, be it remembered. *Old* Kilnsea disappeared years ago; under exceptionally favourable circumstances, and at very low tides, the stones of its old church may still be seen.

All this means an ever-present menace and source of anxiety to the coast-dwellers of Yorkshire to-day. About 2,000,000 tons of "cliff" are washed away annually. The problem is how to defend the coast against its arch-enemy. Defence works take the form in various places of groynes (timber or ferro-concrete piles), or of high sea-walls, or apply themselves to the encouragement of sand dunes and shingle beaches. Bridlington alone has spent thirty thousand pounds on such works.

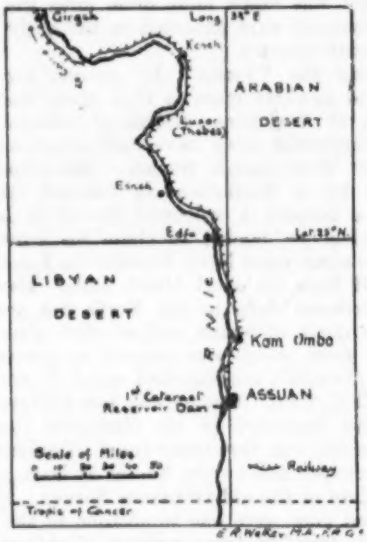
Reclamation Scheme in Upper Egypt.

Kom Ombo, a rocky eminence on which stands the extremely picturesque temple of Ombos, bids fair to become commercially as well as archæologically famous. It is at present putting to the test one of the most remarkable reclamation schemes in Egypt—remarkable inasmuch as (1) it is remote from the Delta, and (2) it stands *above* the level of the Nile.

As to the first point, it must be remembered that new enterprises in Upper Egypt will be at a disadvantage as compared with Lower Egypt for some years to come. The great majority of the engineering works up to now have been undertaken to feed the Delta; the increased volume of water, for instance, which will become available in two years' time from the raising of the Assuan Dam, is destined for the Delta. The Kom Ombo works, some 40 miles north of Assuan and 400 miles away from the Delta, are devised purely for local purposes, and, as such, are worth attention.

* *Warp* is the name locally given to the sediment held in suspension in the tidal waters of the Humber; *warping* is enclosing a body of water till the sediment has been deposited.

Secondly, the hill country to be irrigated stands 75 feet above the river instead of below the level of High Nile, as is the case all over Lower Egypt.



KOM OMBO AND DISTRICT, UPPER EGYPT.

This means a reversal of the ordinary conditions associated with Egyptian irrigation works. Still, the general principles remain the same — there is the usual main canal, with its secondary canals, each feeding numerous small branch canals.

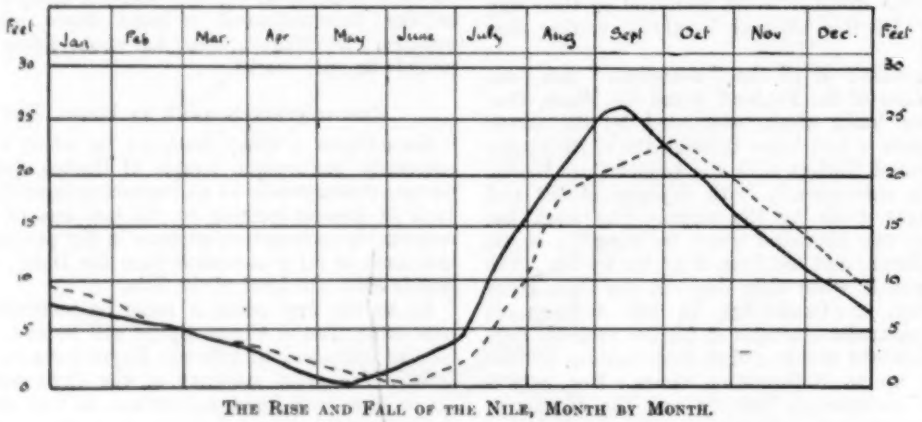
The success of the scheme seems assured. Begun as long ago as 1903, it is now irrigating some 12,000 acres. The soil is good and impregnated with valuable salts, which experiments show are carried down by the flood water at least ten feet below the surface. Steam pumps are everywhere in use, a condition which settles many labour difficulties, and, above all, absolves the fellahin from the necessity of keeping cattle, which were necessary to work their own primitive pumps. Up-to-date steam ploughs and steam threshers have been introduced, and are appreciated; light railways and stone houses, corn mills and repairing shops, stores and schools, and a mosque tempt a population to settle in the district. Corn, cotton, and sugar cane, as a result, have proved wonderfully successful crops.

The main difficulties at first were those usually associated with Egyptian enterprises—namely, labour, climatic conditions, and inaccessibility of manufactured material. Raw materials such as lime, bricks, stone, and sand were either found or made on the spot. Two special difficulties are worth noting. The first was a result of the climate. As the day shade temperature was 115° F., and the nights were very cold, the expansion and contraction of metal were enormous, "ends of sections rising suddenly 20 cm. and 30 cm. in a night." What this entailed may be imagined when one reads that the great culvert, which "commences at the reservoir, and continues for some 5,000 yards until the canal is well established on the high level of the plain," alone used up 1,250 tons of steel. This culvert itself was built on a foundation of sand rendered necessary to overcome the other curious difficulty—namely, the extraordinary swelling of the earth when moistened. "The walls of the first buildings and regulators erected," says a *Times* contributor, "split in the majority of cases through the disturbance to their foundations, and the whole of the banks and the bed-level of the main canal required to be raised to suit the altered contours of the land."

THE RISE AND FALL OF THE NILE.

The mention of Egyptian irrigation schemes is peculiarly appropriate to the present month. It is in September that the Nile is in highest flood at Assuan, after which month the river begins to subside until it reaches its normal level in May. The figures show that the flood is nearly a month later in reaching Cairo.

It should be remembered that the Abyssinian rains are solely the cause of "High Nile." The rainfall of the other great gathering ground, the tropical Lake District, is distributed over the greater part of the year—the lakes themselves act as reservoirs and regulators—and the White Nile therefore is continuously supplied with water. Over the mountains of Abyssinia the downpour commences in April and continues to September, and it is this which sends down the rich, brown muddy water of the so-called "Blue" Nile. The normal rise at Assuan is 26 feet; as 30 feet would mean a dangerous flood, while 21 feet would spell famine, there is not much margin for safety, and the greatest watchfulness and care are demanded on the part of the authorities in the maintenance of the various irrigation works.



THE RISE AND FALL OF THE NILE, MONTH BY MONTH.

At Assuan ——— At Cairo - - - -

The amount of "silt" brought down by the Nile must be enormous. Sir William Willcocks estimates it at 47,000,000 cubic yards per annum. It is as if we were to treble the height of the houses round Hyde Park and Kensington Gardens, and then fill up the whole enclosed area of park and gardens with mud. It is certain, too, that every inch of fertile soil in Egypt at the present time has been brought down and deposited where it is by the river. Egypt is, indeed "the gift of the Nile." And yet it is a small country as areas go. The settled portion is about 13,000 square miles, not twice the size of Wales, though its length—that is, from Wadi Halfa to the Mediterranean—measures some 700 miles direct, or as long as the whole length of all the British Isles, the Shetlands included. Of this settled area, only 9,000 or 10,000 square miles are fit for cultivation—that is, to resume comparisons, an area considerably less than that of the six northern counties of England.

CURRENT EVENTS CONNECTED WITH HISTORY.

BY E. M. WILMOT-BUXTON, WISTONS SCHOOL, BRIGHTON.

The Garibaldi Centenary.

THE present year has seen the centenary of the birth of the famous Italian patriot Garibaldi.

It was in the revolution of 1848 that Garibaldi first came to the front. The news of the fall of Metternich had fanned the smouldering embers of revolt against Austrian rule into a vivid flame. For the first time the whole nation rose, from Etna to the Alps, in united action against Austrian rule; and though the movement failed, and was utterly crushed after the ill-fated battle of Novara (1849), Garibaldi was one of the few who never gave up hope of ultimate success.

Then in 1859 the "kingdom of Sardinia," of which Piedmont formed the main part, came into prominence under the influence of the great Cavour, who persuaded France to join the King of Sardinia against Austria; and in this war Garibaldi, with his bands of undisciplined but fiery troops, did much efficient work.

But France proved a faithless ally, and the country, goaded by oppression and misfortune, rose with the cry, "Italy will do her own work."

Strong measures had to be taken. In return for the promise of aid, she had ceded Savoy and Nice to France, and she was therefore in a position to demand that at least Napoleon should acknowledge Victor Emmanuel's right to the title of "King of Italy."

The annexation and settlement of the troubled states of the south had next to be taken in hand, and this was mainly the work of Garibaldi. With a thousand red-shirted followers, many of whom were bandits from the hill country, the stout-hearted patriot attacked Sicily, which was garrisoned strongly with Bourbon troops from Naples. Within a month he had won the island, turned out the garrison, and was ready to march on Naples (1860). Entering the city he found the king had fled, and proceeded to make himself "Dictator."

Alarmed at this headlong onset, both Victor Emmanuel, King of Sardinia, and Cavour urged him to act with moderation, lest, by attempting too much, he lost all. But Garibaldi swept all such ideas aside with scorn. The "King of the Poor," and the idol of his followers, he knew the temper of the people better than any one, and nothing would prevent him from preparing to march forthwith upon Rome.

The Pope immediately applied to Austria for protection, and now it seemed as though excess of zeal on the patriot's part would not only cause an untimely war against Austria, but prevent all hope of union in Italy; for the States of the Church, aghast at the prospect of the invasion of Garibaldi's undisciplined troops, prepared to rise against him in full force.

So Cavour determined to send an army southward to prevent the patriot by force from entering Rome. On his way thither, however, he found the Italians quite ready to accept Victor Emmanuel, as long as they were not subjected to the devastation of Garibaldi's "brigands," and thus the submission of the States of the Church was easily secured. The great obstacle to Victor Emmanuel's success was now the patriot himself, who was in a position to make himself King of Naples if he chose; but all fear from that quarter vanished when the brave and soldierly Victor Emmanuel entered Naples at the head of his troops, for Garibaldi at once laid aside all personal feeling, and was the first to salute him as King of Italy.

The conquest of Rome had yet to be accomplished, and in the following year the "King of the Poor" again assembled his followers, and raising the cry of "Rome or death," vowed to enter the Holy City or to die in the attempt.

But this raid ended in utter failure, owing to the unruliness of his troops and the strong opposition of Victor Emmanuel's chief ministers, who did not wish things done in this rough-and-ready fashion. Not until he had been severely wounded in a struggle with those sent out to order his return would this enthusiastic zealot give himself up and agree to enter into private life for a time.

In 1864 Garibaldi visited England, and of him at that time Mr. Gladstone wrote to a friend:—

"You are doubtless aware that Garibaldi was entertained in London in a manner perhaps unexampled in the case of a private person. He was entertained at large parties by the Prime Minister, the Chancellor of the Exchequer, and others. The honours paid him by the people and by the Government were, I think, unexampled. He was a man of the most perfect manners—one of Nature's nobles—but of a childlike simplicity."

Again he appeared at the head of his volunteers in the war between Prussia and Austria in 1866, which won over Venice to the rule of Victor Emmanuel; and here once again his rough-and-ready methods would have alienated the Venetians had not his really noble heart been touched by the stern reproof of a Venetian noble, who thus induced him to curb the wild ways of his "red shirts."

Garibaldi, as we have seen, was not always wise in his methods, but he gave Italy just what she wanted at that time—an example of unbounded patriotism and zeal for liberty.

> "For he was Freedom's champion—one of those,
> The few in number, who had not o'erstept
> The charter to chastise which she bestows
> On such as wield her weapons; he had kept
> The whiteness of his soul, and thus men o'er him wept."

Affairs in Macedonia.

The "Eastern question" is one that during the last century has taken a prominent place in European politics.

Briefly stated, it may be put thus: "What are to be the relations between the Turkish Government and the rest of Europe, especially with regard to that part of Europe over which Turkey claims to rule?"

Greece settled this question, as far as she was concerned, in 1832, when she threw off the yoke of Turkey and became independent. Macedonia struggled on in bondage, and only in 1896 dared to uplift her voice to demand reform of Turkish administration, especially with regard to the heavy taxes, illegal exactions, thefts by officials, partial administration of justice, and corruption of State officials. Far from reforming anything, however, the oppression of their rulers waxes heavier; while the Greeks, having thrown in their lot with the latter, help to kill their fellow-Christians before the eyes of the "unspeakable Turk."

A deputation has approached Sir Edward Grey, our Foreign Secretary, in order to urge the necessity of European control in Macedonia, that these terrible massacres may be checked. But in this it appears that Great Britain can act only in concert with the other Great Powers, and neither she nor they seem likely to take a very immediate lead in carrying out a much-needed reform.

America and Japan.

Strained relations are in existence just at present between the United States and Japan, for the former has sent a large part of its fleet to the Pacific stations, nominally for "cruising" purposes only. All the Powers seem, however, to believe that the arrangement is permanent, that America is guarding her interests there, and is on the watch for further developments. Meantime America maintains that Japan is trying to provoke a war with her in order to get hold of the Philippine and Hawaiian Islands. This, however, Japan denies, though she keeps her army and armaments on a war footing, and seems inclined to make much of the grievance that the children of Japanese immigrants are refused admission to the "white" schools of New York.

Affairs in Korea.

The abdication of the Emperor of Korea is bound up very closely with the question of the future independence of his empire.

It will be remembered that Japan's claim to exercise authority over Korea in 1894 was the chief reason of the war with China, which resulted in the Chinese being driven out and Korea being made an independent kingdom. From that time, however, it became clear that the country could never maintain any real independence against the quiet but firmly aggressive wiles of Japan.

During the Russo-Japanese War an agreement was made between Japan and Korea, by which the latter undertook to adopt the advice of Japan with regard to improvement and administration; while, on the other hand, the Japanese Government guaranteed the independence of the Korean Empire.

A year later, though still "independent," we find the country controlled by Japan as to its external relations: Korea must consult her before making any treaties or conventions, and must accept a Japanese Financial Adviser.

Then Japan was represented at court by a Japanese Minister; and thus little by little the independence of the empire has become nominal, and less than nominal.

At the present time the emperor has resigned, owing to pressure from his all-powerful ally, and his half-imbecile son will reign as the puppet of the Japanese Government. The whole thing was inevitable from the first, for it was impossible that a country dead to the necessity of reform and of "renaissance"—dead also to all patriotic spirit—could maintain its independence in face of the well-planned, irresistible, and inscrutable methods of Japan.

SCIENTIFIC AND GENERAL NOTES.

BY J. HART-SMITH, A.R.C.Sc., F.I.C., BATTERSEA POLYTECHNIC.

Sir W. H. Perkin, F.R.S.

With great regret the whole scientific world heard of the death of Sir William Perkin, the founder of the coal-tar colour industry, and one of the most distinguished of British chemists.

Born in London in 1838, he was educated at the City of London School, and passed thence, at fifteen years of age, to the Royal College of Chemistry, where his conspicuous ability soon brought him prominently before the Principal, Professor Hoffman. He devoted much of his spare time and energy to the study of various problems suggested by the course of lectures he was attending, and during one vacation, while studying the synthesis of quinine, found that the oxidation of aniline with potassium bichromate and sulphuric acid produced a dye—mauve. Within a year, with the aid of his father and brother, he had established a factory near Harrow, and placed the substance on the market—a remarkable achievement for a youth of eighteen.

Later, Perkin devoted himself to laboratory work, and soon discovered the valuable method of synthesis of unsaturated aromatic acids, such as cinnamic acid, which bears his name. He also effected the synthesis of coumarin, the odorous principle of the Tonka bean, and was thus instrumental in setting on foot the artificial perfume industry. More recently he turned his attention to the magneto-optical properties of organic compounds, and enriched chemistry with a series of researches on this subject, of which the last account appeared in the Journal of the Chemical Society for May of the present year.

Radio-activity.

Radio-activity at the present time resembles somewhat the science of organic chemistry in its early days, both in its great wealth of detail and in the opportunities it affords for the crucial examination of theoretical predictions. The subject has been investigated both from the physical and from the chemical side, and it is becoming evident that an explanation of the phenomena observed during the disintegration of the atom will soon be found.

It was in 1896 that M. Henri Becquerel made the original discovery of radio-activity in the case of uranium. Madame Curie expressed the view that radio-activity was an atomic phenomenon, and after examination of all the known elements found that thorium was the only other one that was active. An examination of the

naturally occurring minerals showed that many of the uranium ores possessed a higher activity than pure uranium compounds. On Madame Curie's hypothesis, this could only be explained by the presence of unknown elements of great activity, and the result of her successful search for these new elements affords striking confirmation of her principle. It has been found that the active matter present, after removal of the uranium, could be divided into three groups, the first separating with the bismuth (polonium), a second separating with the barium (radium), and a third separating with the rare earths (actinium).

The production of radium from uranium has now been established beyond doubt, both by direct experiment and by indirect methods, the average life of uranium being 5×10^9 years. It is, however, probable that there are several intermediate stages in the change. Radium passes into the emanation with the expulsion of an α-particle, the average life of the radium being 1,150 years. This emanation behaves like a gas, obeying Boyle's law, but has only an average life of five days, nineteen hours, when it changes into the substance known as radium A, with the expulsion of an α-particle. This substance rapidly passes into radium B (four and a half minutes), with the expulsion of another α-particle. There is then a rayless change into radium C; and this expelling an α- and β-particle and a γ-ray, passes into radium D. The average life of the radium B is thirty-one minutes, and that of radium C forty minutes. The period of rapid change is now over, and radium D has an average life of sixty years, forming, by a rayless change, radium E; and this substance, after an average life of eight days, gives a β-ray, and passes into radium F. This substance, known also as polonium, comports itself chemically in every respect as the missing element of the sulphur-selenium-tellurium family, bearing the same relation to tellurium as radium bears to barium.

Fifteen tons of pitchblende yielded five tons of residues after the extraction of the uranium, and from this material fifteen grams of selenium, tellurium, and polonium were obtained. After treating with ammonia, a residue weighing three milligrams was obtained, and this contained all the active material (polonium). From the periodic law the atomic weight of this substance must be between 210 and 212. This very strongly supports the view that the α-particle is an atom of helium, for in the change from radium into polonium four α-particles are expelled, and a reduction of about fifteen units is therefore to be expected. Radium F or polonium expels an α-particle in its change into the unknown radium G. Radium G is the apparent end of the series, and is unknown, because it is not changing, so that it is expected that radium G will prove to be a well-known element. If the atomic weight of radium F is 210 to 212, the choice of the identity of radium G would appear to rest between bismuth and lead. Lead has been found in the uranium minerals, and it has been suggested that it is one of the final products.

Incandescent Electric Lamps.

In the early electric incandescent lights the wire was made of platinum, but the efficiency of the lamps fell away so rapidly that they were almost useless. Wires made of carbon were then used, and until recently have been practically universal. Carbon is now being replaced by metal, as it has been found possible to make wires having a high enough resistance of osmium, tantalum, tungsten, and a few other substances. The first to be placed on the market was the osmium lamp, but great difficulty has been found in making the wire of high enough resistance. The tantalum lamp is now being used largely on direct current services of 100 to 130 volts; it is much more efficient than the carbon lamp. The filament of this lamp will not last long on alternating currents; the wire after a time looks as though it consisted of a number of short cylinders joined together, the centres of the cylinders never being in a straight line. When the lamp breaks down, sometimes the wire breaks at one point only, sometimes at several, when the pieces tangle themselves up in a remarkable way; while at other times the little cylinders appear to separate.

Another lamp, known as the zircon, is said to have the wire made of zirconium and tungsten, and lamps of this material have been made for currents up to 200 volts. It is possible that the wire in this case consists of tungsten zirconide, and not of a mixture of the two substances. Tungsten appears to be the favourite substance, as it gives lamps of very high efficiency. It is hoped that, when the difficulty of making the wires with a high enough resistance has been overcome, a lamp will be made having an efficiency of one candle per watt—that is, an efficiency three or four times greater than that of the present carbon lamps.

LITERARY NOTES.

BY R. BRIMLEY JOHNSON.

IT is indeed fitting that a memorial bust of W. E. Henley, poet and critic, should be set up in St. Paul's Cathedral within five years of his death. Most generally known, perhaps, through his intimate association with Stevenson, he was always the prince of friends—loyal, generous, and, above all, stimulating. His vigorous personality, caustic tongue, and fiery emotions did not present a combination apparently favourable to the exercise of tact and sympathy; but few men knew better how to encourage the young, or have exercised the gift with so much patience and perseverance. His passionate grief for the loss of his little girl would draw curses on some more fortunate friend's chance allusion to a living daughter. But the wounded heart could help others to happiness; and the resolute worker, on one occasion at least, held and cared for a weak brother in letters many weeks in his own house until the fine work, of which Henley detected the promise, had been actually written, sent out, and accepted—a waste of life turned to benefit itself and humanity.

W. E. Henley.

Henley was also a great talker—racy and humorous, never dictatorial, though a trifle dogmatic. He never spared his best, as the present writer can testify, remembering one long summer afternoon in that strangely delightful living-room, once the bar of a village inn, when the host poured forth priceless reminiscences and critical epigrams to the shy and youthful visitor without an introduction who had ventured to ask his advice.

Mr. George Meredith, in one of his too rare critical utterances, has written his epitaph:—

"Henley had the poet's passion for nature, and by reason of it the poet's fervent devotion to humanity. Light of the skies playing upon smoky vapour, city scenery, city crowds, stirred in him those raptures which are the founts of spirited verse.

"Rightly could he speak of his 'unconquerable soul.' It was a soul that had to do perpetual battle with an undermined and struggling body, and this joyfully and, as far as could be possible, buoyantly, for all his nature sprang up to hail the divinity of life. From a bed of sickness that might seem a hopeless imprisonment, he gave out impressions of the daily hospital round and his own moods without a shadow of despair to darken the poetic vision; but when he was restored to his fellows, one involuntary touch occurs in his verse to tell of the sufferings he had passed through — he rejoiced in the smell of the streets. There we had the lover of life rising from the depths.

"Such was the man. As critic, he had the rare combination of enthusiasm and a wakeful judgment. Pretentiousness felt his whip smartly; the accepted imbecile had to wear the weight of his epigram; but merit under a cloud or just emerging he sparkled on and lifted to the public view.

"He was one of the main supports of good literature in our time. His inspiriting heartiness gathered about him a group of young writers who are proud in acknowledging their debt to him for the first of the steps they made on the road to distinction. Deploring we have lost him, we may marvel that we had him with us so long. What remains is the example of a valiant man, the memory of him in poetry that will endure."

* * *

LITERARY life, certainly, is seldom a bed of roses. The month has brought with it news of two writers, widely differing in all save the affection of the public, who stand in need of practical assistance for their declining years. Miss Betham-Edwards, whose first work appeared just fifty years ago, has done much to encourage the *entente* by her thoughtful and well-informed studies of French life and literature. She knows her subject, and she knows her business. Her *Literary Rambles in France*, probably the last of its peers, is a book to possess and to linger over. Such impressions have a higher educational value than any critical text-book. But though she published a novel at the age of twenty-one, though one of her hymns has become a classic, and she has been a successful writer for many years, Miss Betham-Edwards has never been wealthy, and expenses incident upon ill-health will make the practical testimonial of her friends and admirers as gladly received as it is gladly given.

Ouida and Miss Betham-Edwards.

The case of Ouida evoked a good deal of comment, not altogether decorous. It has been hinted that the author of *Under Two Flags* must have been extravagant, while we know she has been generous. A little mud has been thrown at the unfortunate publishers so generally supposed to be flourishing on the brains of hungry authors. In all probability the facts are perfectly simple and no way unusual. Ouida, apparently, always preferred to sell her copyrights, and, for whatever reason, she has not been prudent or selfish enough to lay by for the days of enforced inactivity. That she who has contributed so much to the gaiety of nations, whatever the tone of her work, should be in any real distress is a public disgrace, which will no doubt be promptly and cheerfully wiped out.

* * *

MEANWHILE an author of very different calibre, who may be fairly called a veteran, though only of recent years generally recognised, has been reading the nation a lesson on more serious matters. Mr. Watts-Dunton, who may be said to have leaped into fame at an age when most of us are content to be resting on our laurels, has just issued a sonnet-sequence on the builder of empires. Here the poet resumes an idea which is the corner-stone of Browning's philosophy, that we should measure a man rather by his aims than by his achievement.

In Memory of Cecil Rhodes.

THE QUEST IS THE CROWN.

When Rhodes lay dying on Pain's remorseless bed—
  When even Death's cold wings round pillow and sheet
  Wafted no coolness through the stifling heat—
When comrades whom in glorious days he led
Were stealing round the room with silent tread,
  Watching how Pain could slay yet not defeat,
  Hopeless, yet praying for Hope to come and cheat—
"So little done, so much to do!" he said.

No runner fails who sights a noble goal,
  And sinks uncrowned. Did he, then, run in vain
  Who gave his kin that star-beloved domain
From Kimberley to where the waters roll,
With sunbow-coloured spray for aureole,
  Adown Victoria rolls? Ah, not in vain!

Whatever our opinions on the momentous questions associated with the name of Cecil Rhodes, no one can deny him the title of a great man, and worthy of the poet's pen.

* * *

WE might indulge in many curious speculations as to the numberless chances, mostly fortuitous, which have occasionally placed a man among the "classics" during his lifetime. We have to-day three "classics" with us—George Meredith, Algernon Swinburne, and Thomas Hardy; and certainly the finest literature evoked by the war for which Rhodes must be admitted primarily responsible, was the small book of poems by the last named. The fact of the last volume having just appeared in Messrs. Macmillan's definitive edition of Hardy's Works does not, of course, forbid the hope of our one day gaining a new novel from his pen; but it does undoubtedly provide the opportunity for forming a reasonably complete judgment of his position. His work contains certain elements one could wish absent, but it is instinct with a poetical feeling for nature as an eternal life-force which makes his genius unique. Modern geographies will have to find room for "Hardy's country," which is as real and characteristic a district of England as any county in the survey, and more familiar to many of us than the purlieus of our nativity. For however marked the influence of the actual on his word-pictures, literal identifications are but half-truths. In this matter Hardy is a romancist, for he knows that colouring is more "true to life" than photography. The reader has no need of "documents" here. We know every inch of the ground we shall never tread. He fails constantly in the attempt to mingle subtle problems of thought with the elemental passions born of close communion with mother earth; but far deeper flounderings than he has ever actually succumbed to could detract no whit from the many perfect creations of his sombre genius. I know of no sadder record of human nature than Thomas Hardy's, but the tragedy is based on truth.

Of Thomas Hardy.

THE LITERATURE OF CHILDHOOD.—In our constant study of schools and scholars we have noticed a movement which has our warm sympathy. This is the placing in the hands of pupils for reading purposes some of the best modern "toy books" in place of the school "reader." Teachers who favour this method ought to see three story-books recently published by Messrs. Alfred Cooke, Limited, of Leeds, under the titles of *Hillside Farm*, *Some Wild Animals*, and *The Antelope's Defence*. For the letterpress of these charming volumes our esteemed contributor Mrs. Nesbit is responsible, while the attractive pictures which are reproduced in good colours are the work of capable artists who understand young children.

"WHAT MEAN THESE STONES?"

BY EDMUND A. GREENING-LAMBORN,
Headmaster S. Mary Magdalene Schools, Oxford.

(*Continued from p. 91.*)

BYGONE DAYS IN THE VILLAGE CHURCH.

WE will conclude these papers by considering in detail the characteristic features of a typical village church.

A historical interest is usually to be found even in its situation, a study of the details of which will often reveal the reasons which led the earliest forefathers of the hamlet to choose the spot for their dwelling-place. Church and manor house stand side by side, and often served a common purpose in forming a rallying-point and a stronghold for the people in time of stress. So, though the manor house be vanished, we may see that the church occupies the strategic centre of the village. Sometimes it crowns a hill, sometimes commands a ford, and sometimes it lies across the line from ford to fôrd. But nearly always in the situation of an old church one may see the evidence of the militarism of the Middle Ages, which made every man a soldier first and a churchman afterwards. The position of the church in regard to the churchyard is also of interest. It will be noticed that it stands generally on the *north* side. This gives a southern aspect to the greater part of the churchyard's area, and here most of the graves are placed, out of the shadow of the church, which stretches away to the north. "The rude forefathers of the hamlet" are laid to sleep in the sun on the flowery side of the churchyard. No old graves will be found on the north. The imaginations of a primitive people are very susceptible to light and shade. It may be noticed, too, that the oldest graves are nearest to the church walls, as if, when the last enemy attacked the villager, he sought again the protection of those walls which had shielded him from foes before. As we shall see, those who had the power were buried actually within the church, secure in the knowledge that no evil spirit could possibly enter in to trouble their repose. The fear of evil spirits was a very real one to the superstitious ignorance of the middle ages, and the great yew tree which grows in most churchyards is perhaps evidence of the fact. The yew was supposed to have great power to frighten the foul fiend, and villagers who could not find shelter close to the church walls sought "the yew tree's shade" for safety in their final sleep. Whatever the effect of the yew on the spiritual enemy, it is certain that the long bows cut from these churchyard trees had much to do with the discomfiture of the material French one on the battlefields of Cressy and Agincourt. Branches of yew were perhaps carried in procession by the villagers on Palm Sunday. It has been suggested, too, that the unchanging yew was to the symbol-loving people of those days the emblem of immortality, and as such had a fitting position in the churchyard. In speaking of the yew bows one may mention that the weapons which in feudal times every parish was bound to provide were stored in the parish church, where also was kept the fire-hook, which, in days when buildings were of wood and were huddled together, was used to pull down a burning house, and so summarily prevent the spread of the conflagration. Sometimes on the corners of the tower may be seen the marks which show where the old-time archers sharpened their arrows on the stones. Conspicuous in most churchyards is the churchyard cross—or its remains—which stood on a high "calvary" of steps near the south entrance to the churchyard, and served to remind the entering worshipper of the central fact of the religion to which the church was devoted. At the main entrance to the churchyard there is often a roofed gateway called a lych-gate, under which the bearers made a last pause in carrying a body to its long home.

Standing here one may consider the plan of the village church. The plan of a Norman church is cruciform—that is, there is nave, apsidal, chancel, and transepts, with a central tower. But as early Norman masonry was generally bad, it was often necessary to rebuild the tower after a century or so; and when in Gothic times this necessity arose, the tower was usually removed to the west end, and aisles were sometimes substituted for, or added to, the transepts.

FIG. 47.—FRESCO PAINTING OF S. MICHAEL ON WALL OF SOUTH LEIGH CHURCH.

The plan of the typical village church is therefore a nave, with aisles, a square chancel, and a west tower. Frequently a Norman chancel arch (which formed one of the tower arches) and the first of the nave arcade arches on each side remain to indicate the original plan. In the photograph of North Hincksey Church, Oxford, the intermediate roofing between the chancel and the west of the nave shows the position of the Norman tower before it was removed, in the Early English period, to its present position at the west end. In a small Norman church, as Iffley, the transepts were omitted. When the population of a village increased, an aisle would be added; and on account of the graves on the south, this was usually built on the north side. In the Perpendicular period, in the zenith of

baronial power, it became the fashion to build private chapels or chantries, and these were sometimes added as transepts and sometimes as aisles to the chancel. In order that the worshippers in the aisles and transepts might have an uninterrupted view of the altar and of the Elevation of the Host, a hole called a squint or hagioscope was cut through the wall or pier of the chancel arch. On the eastern gable of the nave, above the chancel arch, may often be seen a bell-cote, which formerly contained the sanctus bell, rung at the moment of consecration, to remind all in the neighbourhood of the solemnity of the act. None of these bells were spared by the Puritans, who in some instances hacked off the cotes as well.

The main entrance to the church is generally on the south. There is also a north door, which has usually been blocked in the eighteenth century. This used to be called the "Devil's Door," and was left open on the occasion of a baptism in order that Satan, who was supposed to follow the child till the very moment of regeneration, might, baffled, make his exit by it. Funeral processions also passed through the church

FIG. 48.—ROOD SCREEN AND LOFT, CHARLTON, OXON.
The entrance to the loft is on the right.

from north to south, symbolising the fact that the way to eternal happiness is through the Church. There is generally a porch to the south door, frequently containing an upper room, called a Parvise or Paradise (those terms, however, were originally applied to the pleasure garden of a monastery). This room was sometimes used as a chapel, sometimes as a priest's study, and sometimes as quarters for the sacristan. In the porch, or immediately inside the church door, was a stoup, which contained holy water, into which worshippers dipped their fingers, making the sign of the cross on their brows on entering the church.

On the wall opposite the main entrance was a fresco painting—that is, a painting in tempera done on a wet plaster surface—representing S. Christopher carrying the Infant Christ; and before this any intending traveller knelt to pray for protection from the perils of the road, which in those days, of course, were many and varied. The whole wall surface of the interior of churches in pre-Reformation days was covered with frescoes, and even the pillars were painted with designs; while, as has been previously said, the foliage was painted in natural colours. In that dead time of art, the Georgian period, all this colour work was removed, or covered with plaster. But where this has been cleared away, the remains of the mural painting may be seen; and in some churches, as at South Leigh, Oxon, the original designs have been carefully restored, and one may see the great painting of the "Last Judgment" over the chancel arch, the "Weighing of Souls by the Archangel Michael," and other pictures of saints and of allegorical meaning. The windows also showed similar pictures in stained glass, but in Puritan times nearly all this was destroyed. At Fairford, Gloucestershire, however, the glass was buried for safety, and when the danger was past was replaced. Here may be seen something of the original effect, though, as the colour is gone from the walls, there is not the richness of mediæval days. Until 1550 the windows were mosaic—that is, the picture was built up of many pieces of glass, a separate piece for each colour. The glass was coloured in the manufacture by the addition of metallic peroxides in the melting pot. Shadow effects were obtained by the use of a brown enamel painted on the glass until the beginning of the fourteenth century, when it was discovered that white glass could be made yellow, and coloured glass receive other tints, by the action of silver-nitrate under heat. Many odd broken pieces of this early-stained glass may be found in churches, let into the leadwork of the modern plain glass, and may be easily identified, as the light passes through them much more freely than through the glass of the later windows, on which the colours were painted and then fixed by fire.

In a mediæval church, however, the object that made the most striking appeal to the eye was the Rood loft. Separating the nave from the chancel was a carved screen rising to the springing of the chancel arch. Along the top of this screen ran a gallery, which was reached by a short flight of steps in one of the piers of the arch. From this gallery or Rood loft the epistle and gospel were sometimes read to the worshippers below, and on it singers took their stand. But its chief use, as its name implies, was to hold aloft the Rood, which was a great carved crucifix with figures of St. John and the Blessed Virgin on either side of the foot of the Cross. (In some churches, as at Merton, Oxon, this is carved also in a niche over the south door.) Lights were burned in the Rood loft at festivals, from which fact it was sometimes called the Candlebeam. Soon after the Reformation an order was issued that all Rood lofts should be removed; but examples, without the Rood, are still to be found in some churches, as at Church Hanborough and Charlton, Oxfordshire. In almost every church evidence of their presence exists in the blocked entrances, or on the capitals of the chancel arch which have been cut to accommodate the beam.

(To be continued.)

A USEFUL HANDBOOK.—Every one with the remotest connection with education—this is not invidious—ought to purchase the *Handbook of Education*, published by the N.U.T., under the experienced and able editorship of Messrs. Yoxall and Gray. The price is 3s. 6d. net, post free 3s. 10d.; and as for the contents, we can honestly endorse the editors' claim that no such collection of detailed information of such importance to education authorities, their members and officials, the managers of schools and teachers, and to all interested in the administration of public education—elementary, secondary, higher—and in the conditions of administration, qualification, and service connected therewith, has ever been brought together before.

EDUCATIONAL SCIENCE AT LEICESTER.*

EXTRACTS FROM THE ADDRESS OF SIR PHILIP MAGNUS.

"ONE of the five articles of what is known as the Japanese Imperial Oath states, 'Knowledge shall be sought for throughout the whole world, so that the welfare of the Empire may be promoted;' and it may certainly be said that, as the welfare of our own Empire is largely dependent on educational progress, a wide knowledge of matters connected with education is indispensable, if we are to make advances with any feeling of certainty that we are moving on the right lines."

* * * * *

"The consideration of education as a subject capable of scientific investigation is complicated by the fact that it necessarily involves a relation—the relation of the child or adult to his surroundings. It cannot be adequately considered apart from that relation. We may make a study of the conditions of the physical, intellectual, and ethical development of the child, but the knowledge so obtained is only useful to the educator when considered in connection with his environment and future needs, and the means to be adopted to enable him, as he grows in physical, intellectual, and moral strength, to obtain a mastery over the things external to him. Education must be so directed as to prove the proposition that 'Knowledge is Power.' It can only be scientifically treated when so considered. Education is imperfectly described when regarded as the means of drawing out and strengthening a child's faculties. It is more than this. Any practical definition takes into consideration the social and economic conditions in which the child is being trained, and the means of developing his faculties with a view to the attainment of certain ends."

* * * * *

"Unmindful of the fact that education is a relation, and that consequently the same system of education is not equally applicable to different conditions, there were many in this country who were only too ready to recommend the adoption of German methods in our own schools. Experience soon showed, however, that what may have been good for Germany did not apply to England, and that, in educational matters certainly, we do well to follow Emerson, who, when addressing his fellow-citizens, declared: 'We will walk on our own feet, we will work with our own hands, and we will speak our own minds.'"

* * * * *

"We have not yet recognised the extent to which experiments in education, as in other branches of knowledge, may help in enabling us to build up an educational science. I venture to think that experimental schools might with advantage be organised under the direction of some of our larger local authorities. The children would certainly not suffer by being made the subjects of such experiments. The intelligent teaching which they would receive—for it is only the most capable teachers who should be trusted with such experiments—would more than compensate for any diminution in the amount of knowledge which the children might acquire; and indeed such experimental schools might be conducted under conditions which would ensure sound instruction. Many improved methods of teaching are constantly advocated, but fail to be adopted because there is no opportunity of giving them a fair trial. As a general rule, it is only by the effort of private individuals or associations that changes in system are effected, and teachers are enabled to escape from the old grooves on to new lines of educational thought and practice."

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"Very rightly our students in training for the profession of teachers are expected to study the writings of Locke, Rousseau, Milton, Montaigne, and others; but many are apt to overlook the fact that these writers had in view a different kind of education from that in which modern teachers are engaged, and that their suggestions, excellent as many of them are, were mainly applicable to the instruction to be given by a tutor to his private pupil, and had little or no reference to the teaching of the children of the people in schools expressly organised for the education of the many. Only recently have we come to realise that a democratic system of education, a system intended to provide an intellectual and moral training for all citizens of the State, and so organised that, apart from any consideration of social position or pecuniary means, it affords facilities for the full development of capacity and skill wherever they may occur, must be essentially different in its aims and methods from that under which many of us now living have been trained. It has also been brought home to us that the marvellous changes in our environment, in the conditions under which we live and work, whether in the field, the factory, or the office, have necessitated corresponding changes in the education to be provided as a preparation for the several different pursuits in which the people generally are occupied. Yet notwithstanding these great forces which have broken in upon and disturbed our former ideals—forces the strength and far-reaching effects of which we readily admit—we still hesitate to face the newly-arisen circumstances and to adapt our educational work to its vastly-extended area of operation and to the altered conditions and requirements of modern life."

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"Our young people have gained very little practical knowledge, and what they have gained they are unable to apply: they lack initiative, and too often the ability to use books for their own guidance, or the desire to read for self-improvement. We seem to have erred in neglecting to utilise practical pursuits as the basis of education, and in failing to build upon them and to evolve from them the mental discipline and knowledge that would have proved valuable to the child in any subsequent occupation or as a basis for future attainments. We have made the mistake of arresting, by means of an artificial literary training, the spontaneous development of activity, which begins in earliest infancy and continues to strengthen as the child is brought into ever closer contact with his natural surroundings. We have provided an education for our boys which might have been suitable for clerks; and, what is worse, we have gone some way, although we have happily cried a halt, to make our girls into 'ladies,' while we have run some risk of failing to produce women."

* The Educational Section of the British Association, which met at Leicester, was under the presidency of Sir Philip Magnus. Other interesting papers and addresses will be dealt with next month.—ED.

"In the practical pursuits connected with the field, the workshop, and the home, and in the elementary teaching of science and letters incidental thereto, we might lay the foundation of a rational system of primary education.

"These three objects—the field, the workshop, and the home—should be the pivots on which the scheme of instruction should be fixed, the central thoughts determining the character of the teaching to be given in rural and urban schools for boys and girls.

"I would strongly urge, however, that the child should receive less formal teaching, that opportunities for self-instruction, through outdoor pursuits, or manual exercises, or the free use of books, should be increased, so that as far as possible the teacher should keep in view the process by which in infancy and in early life the child's intelligence is so rapidly and marvellously stimulated."

* * * * *

"The problem of primary education is to teach by practical methods the elements of letters and of science, the art of accurate expression, the ability to think and to control the will; and the ordinary school lessons should be such as lead to the clear apprehension of the processes that bring the child into intimate relation with the world in which he moves."

* * * * *

"There must be no class distinctions separating the public elementary from the State-aided secondary school. The reform I have suggested is unaffected by such criticism. The practical training I have advocated, whether founded on object lessons furnished by the field, the workshop, or the home, would prove the most suitable for developing the child's intelligence and aptitudes, and for enabling him to derive the utmost advantage from attendance at any one of the different types of secondary schools best fitted for his ascertained abilities and knowledge. The bent of the child's intellect would be fully determined before the age when the earliest specialisation would be desirable. No scheme of instruction for primary schools can be regarded as satisfactory which is not so arranged that whilst providing the most suitable teaching for children who perforce must enter some wage-earning pursuit at the age of fourteen, or at the close of their elementary school course, shall at the same time afford a sound and satisfactory basis on which secondary and higher education may be built."

SCHOLARSHIPS FOR GIRLS.

PRACTICAL scholarships are required leading girls from the elementary school to some form of domestic or industrial training.

These should never be awarded on a written examination. They should depend, not on the power to write well, spell correctly, and describe clearly in accurate English, but should be bestowed on the girl of faculty, the bright, intelligent, but not especially intellectual girl, whose senses are alert, who has the true eye, the delicate touch, the power to *do*.

It is quite as necessary to prepare the future wife and mother for the duties of home-making, the future workwoman for the labour of the workshop, the future servant for the routine of the kitchen, as it is to help the future teacher to obtain the knowledge to enable her to fulfil the duties of the schoolroom.

All work is sacred, and true education helps people to live their lives so as to get and to give the greatest possible amount of good.—MISS ISABELLA CLEGHORN.

CHAOS IN THE SCHOOLS OF RUSSIA.

BY VICTOR E. MARSDEN, MOSCOW.

FOR at least two years past no work has been done in the schools of Russia, except, perhaps, the rural common schools. From the universities and other higher schools of equivalent rank down to the secondary schools of all categories, teaching has been impossible and learning entirely lost sight of. Exceptions to this general rule there are, of course, but they are not more than a single grain of corn in a bushel of chaff.

The students of the universities, of the engineering institutes, of the innumerable other institutes—the mining, the agricultural, and even the army medical—have, of course, had their "duties" to perform in the reform movement. Knowledge is still so unevenly distributed and so little developed generally in Russia that any student occupies towards the masses very much the position held in the Middle Ages with us

A CORRIDOR.

by a cleric who happened to be literate. Instead, therefore, of pursuing the regular courses of university studies, ninety-nine out of every hundred students have been engaged in filling their brains with the theories of government, preferably the most recent and newest, chiefly those of German Socialism and of the Great Revolution in France. This perilous stuff has no sooner got a ferment in their youthful minds than they burn to expound the new doctrines of political salvation to every one around them. All the political "demonstrations," "manifestations," etc., of the past few years—except those of the Black Gang, which are organised by the agents of the Russian Government—have been engineered by students. By "strikes" and disturbances of various kinds, the students have succeeded in wresting from the Government a nominal "autonomy" for the universities. In old days professors, deans of faculties, the rectors, and other authorities of the universities were appointed by the bureaucracy at St. Petersburg, and their choice was

directed much more by the "political soundness," otherwise subservience to bureaucratic ideals, of the aspirant than by any other qualification. Now the

IN THE CLASSROOM.

(Fine reception halls and corridors and naked classrooms are characteristic of Russian secondary schools.)

universities have the right—on paper—to appoint their own professors, as is done everywhere else in the world. Hitherto a scholar of the calibre of our professors has either been compelled to vacate his chair, or has failed to ever secure a chair at any university: many have been driven into other countries. Some day, as time continues creating vacant chairs, Russian universities will bear some relation fairly comparable to the universities of the rest of the world. It is too soon to look for very great changes yet. Unfortunately, instead of utilising the new privileges to the full, and making their universities centres of scholarship, the students have been carried away by the political maelström, and there will be a sensible deficiency of men qualified to occupy university chairs for probably many years to come. The spirit of freedom has breathed deeply into the very soul of the people; and the students, at any rate, seem to regard it as sufficiently vivifying in itself, without any tilling of the brain by the dull desk and elbow work of the old days of scholarship.

The secondary schools follow close on the heels of the universities, from the highest forms even to the lowest. The "movement" is reduced to the absurd when little fellows of eight decline to rise in the morning at the urgent summons of their ushers, declaring, "We *san't* get up; we's on strike!" in the lisp of childhood, which, in some forms, lasts longer with Russians than with us. The secondary schools, the gymnasia, the commercial schools, the real schools, the seminaries (where the future *popes* get their modicum of education), all emulate their elders at the universities. Playing truant, "strikes," mutinous outbreaks with smashing of windows and furniture, occasional attacks on hated masters with knife or revolver, more or less alarming "bomb" explosions on the premises, and so forth, are the ordinary every-day events of secondary schools throughout Russia. "Demonstrations" in the streets, processions which would only be ridiculous if the police would leave them alone, but are turned into political events when Cossacks, mounted police, gendarmes, with whips, sabres, revolvers, are ordered to disperse these "dangerous revolutionaries,"—these, as may be imagined, occupy the minds of boys—ay, and of girls too—for weeks before they take place, and for months afterwards, to the utter exclusion of mere work.

The fifteen-year-old schoolboy nowadays in Russia reads his newspaper, plays at politics in the Duma, assumes the name of his favourite speaker, adorns his classrooms with portraits of members of the Duma who are anathema to authority and, for the most part, are now in jail. If a too zealous master, ignoring the general situation, presumes to inflict a well-deserved punishment on these budding senators, it is ten to one he has to listen to a harangue upon the inalienable rights of "man" (there are no "boys," of course, nowadays!), with apt and sometimes really clever appropriations from such authors as Marx, Bebel, Lassalle, Nordau, Nietzsche, and others of native growth from seed sown by names like these. Even religion has gone by the board; and that is perhaps the worst sign of all. Fifteen-year-old boys reading Renan in class when they should be mastering the lives of Russian saints is a common and a very unpromising feature of the secondary school to-day. Pornography in the shape of cheap but well-executed weekly papers, containing the cream of the subject from other lands, with copious and unmistakably attractive illustrations, serves to distract some minds from politics. It has been noticed, to the detriment of the Government, that while political journals are harried and worried with a persistency of persecution which is a true index of their value, the pornographic literature in weekly-paper form is freely sold and openly displayed everywhere. Many boys and not a few girls in every class, from twelve years old to twenty, buy and read this stuff, pass it round, and rarely show a trace of shame if

A GROUP OF ALL AGES ON A "STRIKE" DAY.

caught. It is only one branch of the tree of liberty and knowledge. One hesitates to say that the Government deliberately encourages this vicious but attrac-

tive literature with the intention of supplanting politics in the minds of the young; but it is possible to say that if that were indeed the deliberate intention of the Government, greater freedom could not be accorded to these dangerous papers.

Another form of literature which the Black Gang wirepullers, who are undoubtedly subsidised out of public funds by the Government, have established for the ignorant and those of susceptible age, is that which treats of the "occult sciences." Spiritualism, occultism in all forms, is a stock pursuit of the schools nowadays. Indeed, its superstitions vie with the doctrines of pure Socialism for domination over that part of the mind of youth which once was occupied with the teachings of the Church. The former "science" is harmless politically, and is for that reason encouraged by the Government agents; but it leads to something not easily distinguishable from insanity when pursued too far in the environment of the Russian schoolboy. The doctrines of Socialism, in themselves not unattractive to youth with its naturally high ideals, are extremely

"Off Home"—"Strike" Day.

dangerous to the government of a misgoverned state like Russia, and are therefore zealously persecuted, and thus acquire an added zest in their pursuit, on the age-old principle that forbidden fruit tastes sweetest in the eating. The golden age to come, when all men shall be pure, all strong and healthy, all contented, all equal, all equally good, and strong, and beautiful, and contented—it is the dream of every age of the world, "when the lion shall lie down with the lamb," when heaven descends upon earth. Little wonder, under present circumstances in Russia, such doctrines appeal to youth, ignorant of the real factors of life on earth.

But whither does all this tend? It is a question that is very deeply exercising the minds of thinking men. The Government is too busy, too poor, too helpless—or is it merely blind or indifferent?—to attend to these awful phenomena of the present day. There is but one hope of saving the schoolboys and students of to-day, and that is the realisation in fact of the Czar's promises of reform on paper. When the parents of the present generation of youth are satisfied with the form of government, their children will settle down; it will take longer for ardent youth to settle down to plain facts of life, but only in this way lies hope for Russia's future. Unhappily, the Government has decided to revert to autocracy, leaving the "Constitution" to the glories of print and paper—merely one of a series of historical pictures, representing ideals of truth and beauty, which adorn the gilt and stucco halls of Czardom. Out of chaos came form. But the chaos in the minds of the future citizens of a free Russia gives little hope of producing an acceptable form from any point of view, if reform be deferred until the present generation of schoolboys take hold of life in earnest.

REFORMS NEEDED IN THE ENGLISH SCHOLARSHIP SYSTEM.

BY PROFESSOR MICHAEL SADLER.

1. **Our fundamental needs are the reform of the elementary schools, both in town and country, and the provision of new types of secondary school curriculum.** The conditions under which the vast majority of English elementary school teachers are at present obliged to work prevent them from giving a sufficiently individualised training, moral and intellectual, to the children committed to their care. The improvement of the elementary school will secure for the children the kind of early training which will best enable the more promising of them to take advantage of advanced courses of study. It will also tend to lessen the social cleavage which at present destroys the unity of English education in its elementary stage. But any effective improvement will be very costly, and necessarily slow in operation. The necessary counterpart of the reform of the elementary school will be the increased differentiation of the secondary schools and the better adaptation of their curricula to modern needs. Nearly all the secondary day schools in England need more generous financial assistance in order to attain a new measure of intellectual efficiency.

2. The English scholarship system in its present form gives special advantage to urban districts. It fails adequately to meet the needs of promising children living in the country. These are often prevented by distance or expense from gaining access to a secondary school. In some cases more boarding scholarships are needed. Secondary "tops" should be added to some centrally-situated rural elementary schools.

3. Much more should be done to provide higher secondary education of first-rate quality in day schools in many smaller towns. There is a danger of higher secondary education becoming (outside a few favoured centres) the privilege of the well-to-do. The new Regulations for Secondary Schools increase this danger. Government grants at a considerably higher rate are needed for higher secondary schools and in aid of higher secondary "tops" in other carefully-selected secondary schools.

4. There is need for a more generous provision of intermediate and higher scholarships to enable pupils of special ability to complete the full course at a higher secondary school, or to proceed to an institution of university rank or of advanced professional training. For girls especially more higher scholarships are required, tenable at a variety of institutions for academic or practical study.

5. The fixed value of the scholarships awarded by open competition at the public schools and universities might well be reduced. Ample supplementary allowances should be given to those scholars who need them, after private inquiry into the circumstances of each case.

6. Methods of selection which set a premium upon cramming and lead to the neglect of the candidate's health and physique should be sternly discouraged. The best examinations now conducted for junior scholarships are confined, so far as written tests are concerned, to papers in English and arithmetic. The written examination should, where numbers are not too great, be supplemented by a simple oral test. The examiners should also have access to the pupil's school record. Stress should always be laid upon physical fitness. Each local scholarship system might thus become an incentive to the healthy upbringing of children by making a fair standard of physical development a condition of eligibility.

The Practical Infants'-School Teacher.

WALL DECORATION IN INFANTS' SCHOOLS.

BY CLARA E. GRANT.

An Important Matter.

IN an age when educational methods are receiving such thoughtful study—when the old is facing on all sides the challenge of the new—and when we are realising that each detail is important if the whole is to be effective, it is surprising to find here and there certain factors which seem to have escaped notice; and of these a case in point is that of the decoration of our school walls. We hasten to acknowledge that there are many exceptions, but the fact remains that in too many cases the school walls have not received the thoughtful attention which they demand as important factors in our educational equipment.

There are many reasons for this. Good pictures are often costly; the "bread and cheese" material looms large in the requisition list; teachers rarely have an absolutely free choice; "hanging" is difficult and tiresome; and there are so many, many claims on the teacher's time that the so-called "little things" are allowed to slip. Yet, as a matter of fact, there are few factors in education which we can afford to regard as "little things." We are beginning to see that a child's education is not compassed by the subjects on the time-table, but that it is really the play of all formative influences on the child's life and character. But if infants' teachers are not now asked to show what they can make of their children by means of the "three R's," they will assuredly be asked to show what they can do by all the other means which are superseding them. Varied occupations, play games, stories, together with the more natural treatment of such formal work as is attempted, are doing much, but our school walls have too often not been asked to do their share.

Choice of Pictures.

Young children, to whom so strong an appeal is made through the eye, are fond of all bright things, and invariably love pictures. The walls provide the great opportunity for developing their joy and taste in pictures; but if we wish to develop and train their taste, we must study their attitude towards art at each stage.

This is most important. It has been fondly held that exquisite art must unconsciously elevate children and lead them on to a true artistic development; that, to quote Professor Wiebe, "if the fact that merely looking at the beautiful favourably impresses the mind of the grown person in regard to direction of its development, enabling him to more fully appreciate the good and true, and noble and sublime, this influence upon the tender and pliable soul of the child must needs be greater and more lasting." We forget that it is not so much the grown person as the grown *mind* which appreciates fine art, and that mind only grows in its own way and by its own stages.

At a certain art gallery in a poor neighbourhood it was found that a very indifferent painting of a beautiful legend, explained by a "watcher," attracted far more attention than an almost priceless landscape of Corot's. And why? Because with simple minds the story must come in interest before the degree of art with which it is portrayed, and a human story comes before a landscape in interest.

In an article full of insight, once contributed to the *Daily News*, on "Round the Whitechapel Gallery," the writer describes how he found a lady vainly trying to make a group of boys enthuse over the beauties of "Sunset in the Forest," and how he thereupon begged the boys to take *him* round. He told how they talked of the "studies in colour," and "how the peace of evening contrasted cruelly with the girl's despair," until he found they were quoting from the annotated catalogue, and insisted on getting their own impressions. These were "few and simple: they loved the familiar things of their own lives—were in raptures when they found 'Billingsgate' on the boxes in 'A Cornish Fish-Market.' Generally speaking," says this man of vision, "impressionist work and atmospheric effects were beyond the boys."

In the admirable Whitehall "Suggestions" we read that "no attempt need be made to bring the subjects within the limits of what a child can understand." The note wisely adds, "though a certain choice of subject is inevitable." We venture to think that there is here a little danger of confusing the functional with the intrinsic value of a thing. The most beautiful things may fail in their purpose if exhibited to the wrong person or at the wrong time. Pictures which in subject or treatment are far beyond the child's capacity will make little or no appeal to him.

A pertinent question was asked recently in the *National Congress of Mothers Magazine* (America): "Public school art associations all over our country are becoming very active in placing in our schools reproductions of great works of art. Suppose they cover the walls of schoolrooms with the finest pictures .....will they have served pupils in the most effective way?" May we not answer it in the words of Professor Earl Barnes: "By putting before a child art which is far beyond him, we may create between him and an appreciation of true art a barrier which he may never cross." Photographs of beautiful scenery and building are not suited to young children who love colour. And as the child's colour sense is not yet developed, it is the bolder, cruder colours that attract him before all "the million subtleties of light, shade, and colour." As Madame Michaelis once said, "Children are like savages; their love of colour and form are crude. The colours of the papers and other material which children always have in the kindergarten are not always beautiful, but in very young children taste has not yet been toned down by Morris and Walter Crane and so on, and it is natural and right that it should not be so." It is probably more from the æsthetic than from the patriotic sense that little children sing, "Three cheers for the Red, White, and Blue."

If monochromes of any kind are used, then the subject must be one which appeals to a child—namely, such as deals with human activities, play of animals,

etc., though occasionally pictures of landscapes, etc., may be chosen for their informative value only. Large, bright-framed pictures of flowers please children by their colour, and help in nature study; but the chief interest will usually be the human one. The ideal-coloured picture would be, of course, the well-painted one. How many of us must have coveted for our schools the beautiful paintings of juvenile subjects in famous galleries. It is one of the ironies of life that the rich man, surrounded by all that is beautiful, enjoys the artist's original, whilst the poor, in their gray surroundings, may only have the copy.

Shall we ever see the day when the myriads of artists now struggling for a living will be employed by the nation painting children's pictures for the nation's children? But even then the artist must be a psychologist first. In the meantime, paintings being out of the question, we should like to make a plea for some of the large-coloured plates presented with Christmas annuals—that is, for infants. They are often large, bold, simple in treatment, and beloved of babes. Well framed, they are excellent for the "babies," who love the chubby "Babes in the Wood," sleeping under very green leaves, whilst robins with very red breasts sing the dirge mournfully overhead. Attempts are being made to provide pictures for "babies" on more psychological lines—for example, Caspari's friezes, which, in spite of a little artificiality, are bright and warm, and please little ones. We would even make a plea for sundry advertisements, if only the name of the guilty firm could be erased—for example, the fat and lean cats on the roof, which admirably portrays the duty of "feeding the hungry" and the need of a milk diet, and is full of comic interest even to children. (We say "even" to children, because many modern "cat" pictures portray satires whose point is quite lost on children.)

The type of picture should, of course, rise with each class by gradual steps, but the "infant" must not be forgotten throughout.

Certain pictures which are merely informative—that is, useful for lessons and general information—may be used where beautiful enough; but all of what may be called "shop" pictures—for example, botanical sheets and cards, prints on rollers, etc.—should be kept out of sight, and only used as occasion requires. It is not so long since modulators and music sheets were frequently found on school walls, like the maps in the senior departments, whilst educational authorities have had to prohibit the hanging of physiological charts on the walls. As a rule, cards and sheets are not suitable. They are not decorative, and they soon spoil.

We should all agree that the lessons conveyed by a picture, apart from its decorative value, should be elevating and cheering in character, and therefore it is not wise to hang up to permanent view pictures showing the sterner truths of nature in all their severity. One recalls terrible pictures on baby-room walls of savage, open-mouthed tigers and cats in the act of pouncing on their prey. It is neither wise nor sincere to shirk the sterner truths of nature, as is done in some modern infants' schools, where we vainly try to hide the fact that animals are not all vegetarians; but the "real" need not mean undue realism in all its horrors, when our eyes should rest on what comforts and inspires. Nay, more. Most young children have a strain of savagery about them, and easily learn to gloat over what, to them, looks like "cruelty." Kittens at play therefore are more suitable than cats slaughtering their prey. Metaphorical pictures, too, are not very suitable for young children, who take them too literally, as they will do with figurative literature. Pictures, as a rule, should be large and not too crowded with detail. Small pictures cannot be seen by the farthest child in the class, and much detail tends to obscure the main subject.

The walls themselves are not usually under the teacher's control, but they are, fortunately, usually plain and self-coloured. Where light is lacking, it is well to have light walls (compare "Suggestions"), otherwise a good green is very effective and restful to the eye.

(To be continued.)

I LOVE SIXPENCE.

[The following nursery song is taken from No. 1 of Messrs. Thomas Nelson and Sons' new series of Poetry Books entitled "A Cycle of Song." The verses have been set to music by Mr. Thomas J. Hewitt, and the editor hopes to present the composition to his readers in next month's *Practical Teacher*.]

I love sixpence, pretty little sixpence,
I love sixpence better than my life;
I spent a penny of it, I spent another,
And I took fourpence home to my wife.

Oh, my little fourpence, pretty little fourpence,
I love fourpence better than my life;
I spent a penny of it, I spent another,
And I took twopence home to my wife.

Oh, my little twopence, my pretty little twopence,
I love twopence better than my life;
I spent a penny of it, I spent another,
And I took nothing home to my wife.

Oh, my little nothing, my pretty little nothing,
What will nothing buy for my wife?
I have nothing, I spend nothing,
I love nothing better than my wife.

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15. Songs of Dreamland—Part II.
16. Songs of Endeavour.
17. Songs of Quiet.
18. Songs of the Streams.
19. Sacred Songs.
20. Songs of the Seasons.
21. The Poet's Lyre.
22. Songs of the Sea.
23. Songs of the Country.
24. Songs of the City.

Words by SYDNEY HARROWING. **"THE RIVER."** *Music by* HAYDN.

ARRANGED BY T. MASKELL HARDY.

(Copyright.)

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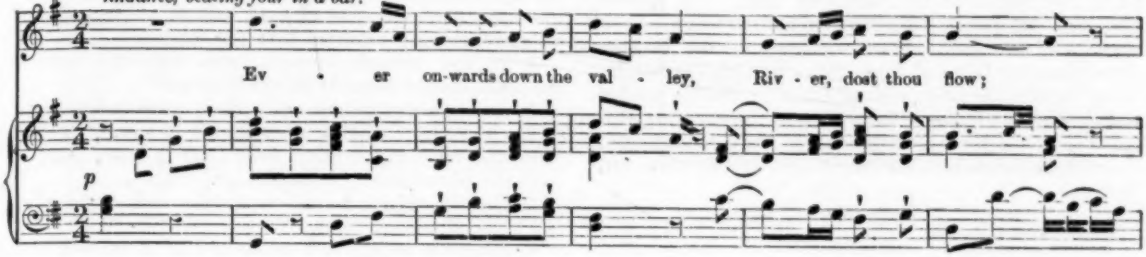
Andante, beating four in a bar.



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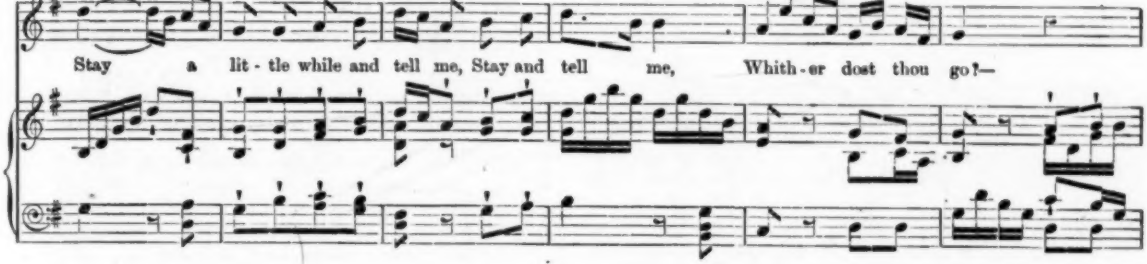

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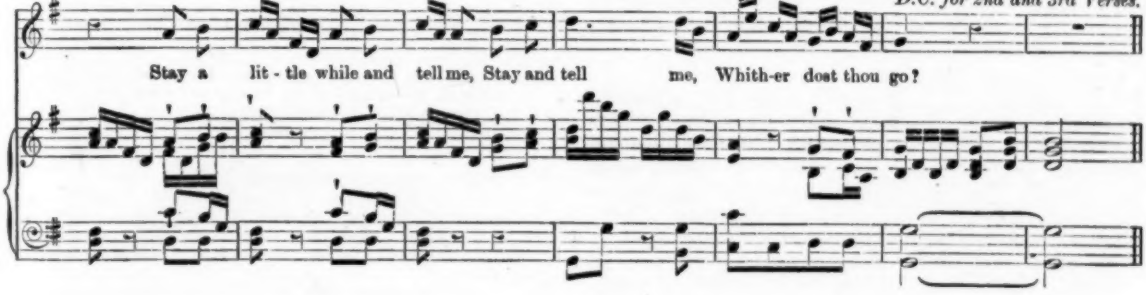
D.C. for 2nd and 3rd Verses.



1.

EVER onwards down the valley,
River, dost thou flow;
Stay a little while and tell me,
Stay and tell me,
Whither dost thou go?—
Stay a little while and tell me,
Stay and tell me,
Whither dost thou go?

2.

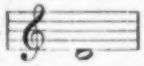
"From my birthplace in the mountains,
Gath'ring as I flow,
Broad and deep, and singing ever,
Singing ever,
To the sea I go—
Broad and deep, and singing ever,
Singing ever,
To the sea I go."

3.

Life is like thee, shining river,
Flowing strong and free;
From the dawn of morning breaking,
Morning breaking,
To eternity—
From the dawn of morning breaking,
Morning breaking,
To eternity.

Teaching Notes on "The River."

1. As one passage in the song goes as low as



there will be a danger of the children using the "chest voice" on that and the following tones. To prevent this, the following exercises should precede all rehearsals of the song. Each exercise should be sung three times to *Loo* and three times to *Loh*, the teacher being careful (*a*) that each exercise is *exactly pitched*, and (*b*) that the lowest tone is sung in the same register, or "voice," as the highest—that is, the "head voice." There must be neither harshness nor forcing in its production.

Exercises.

Children take breath while teacher sings or plays. 1. Children sing.

2. Before each rehearsal practise the following words, which contain awkward vowels. Each word should be sung on a monotone several times after the teacher's pattern.

(*a*) *While, my, like, shine, I, life.*

The diphthong I is generally sung *i-ee*, especially when two notes of the music are given to the syllable containing it. Thus, in the second verse, the common rendering of "from my birthplace" is "from *my-ee* birthplace." This fault is counteracted by beginning on the vowel AH (as in father) and *finishing* upon I. Thus: *whah-ile, mah-i, lah-ike, shah-ine, ah-i, lah-ife.*

(*b*) *Break, stay, place. Break*, often sung *brai-eek*, etc. Prevent this by beginning on UH (as in cur) and finishing upon AI. Thus: *bruh-ake, stuh-ay, pluh-ace.*

(*c*) *Down, thou, mount.*

The diphthong AU (as in down) is one of the worst possible for the production of good tone.

Make this disagreeable sound as short as possible by singing nearly the *whole of the syllable* to the vowel AH, and only just touching AU at the finish. Thus: *dah-own, thah-ou, mah-ount.*

3. In the seventh bar the D, or *soh*, may present a difficulty, on account of its time-length (two and a half quavers, or two and a half beats). This may be obviated by directing the children to sing the word *stay* twice. Thus:—

When this can be done, it will be easy for the children to substitute *sta-ay* for the double *stay*.

4. In the eleventh, fourteenth, and seventeenth bars the quavers or half-beats should be sung very deliberately, and the first of each pair of quavers should be more strongly accented than the second.

5. In the second, seventh, and sixteenth bars a *crescendo* should be made on the D, or *soh*.

6. As the accompaniment is often quite independent of the voice part, the children should be taught to sing from the teacher's beating before being asked to sing with the pianoforte.

7. Breath should be taken at the end of each of the lines as printed below.

8. Both the words and music are of a smooth and peaceful character. The whole song therefore should be an exercise in soft and restrained singing.

THE STORY OF THE RIVER.

A SCHEME OF CONNECTED LESSONS FOR STANDARD I.

BY E. MONA CLAY AND R. M. M. ATKINSON, INSPECTORS OF SCHOOLS, MANCHESTER EDUCATION COMMITTEE.

TWO of the lessons for this month have been chosen as illustrations of the effect of water on the land. This is best seen by the seaside, where water often undermines the land to a considerable extent, forming numerous caves and indentations of great interest to young explorers.

I.—SKETCH OF A LESSON ON THE SEASIDE.

Required for the Lesson.

A large tin tray, sand, shells, seaweed, etc., with which to make a model of the seaside during the lesson; also, if possible, a sample of sea water.

Preparation.

Question the children to see what ideas they already have on the subject of the lesson, and refer to the delights of the seaside in summer time.

Presentation.

I. The sea.—Let the children who have been at the seaside relate what they know of the sea itself.

(*a*) *Colour.* What is the colour of the water? Compare with the colour of the sky.

(*b*) *Taste.* Allow the children to taste the water of the sample, and find out that it is very salt and somewhat bitter.

(*c*) *The waves.* Get one of the children to blow on the surface of the water of the model, first gently and then more vehemently, to illustrate the action of the waves.

II. The shore.—(*a*) *The sands.* Let the children describe the appearance of the sands at the seashore. Refer to the joys of castle building, digging, wading, and boat sailing. Let some of the children help to build up the model.

(*b*) *The pebbly beach.* Give a brief account of the stony part of the beach, with its rocks, pebbles, and remains of different coloured shells.

III. Plant life.—Refer to the plants that grow in the sea which we call seaweeds. Describe and show different varieties. Tell of the little rock pools where many specimens may be found.

IV. Animal life.—(*a*) Let the children describe the various forms of animal life seen at the seaside, as, for example—(1) fish; (2) sand worms and grubs; (3) jelly-fish; (4) shell fish; (5) such creatures as shrimps, crabs, prawns, etc.

(b) Brief mention might also be made of the seagulls, and their habits and food contrasted with those of birds familiar to the children.

Association.

Associate with a pond. Compare the varieties of life found in and about it with those of the sea.

Formulation.

A simple generalisation in the children's own words.

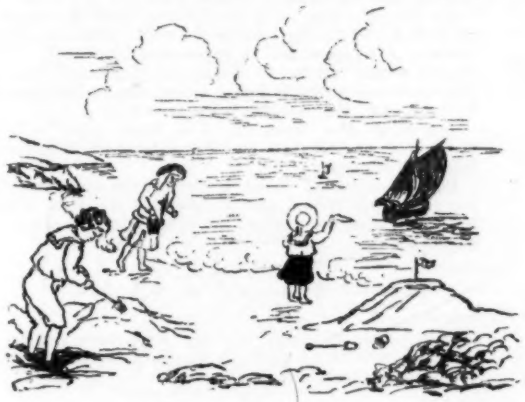
Application.

See occupations.

EXPLANATION OF ILLUSTRATIONS.

Teacher's illustration.—This may seem at first sight too simple a subject to treat of with children of seven to eight; but when we consider how many and varied are the sidelights which we may bring to bear upon it, the subject will grow in interest, even with older children than Standard I.

Take, for instance, the idea of "rivers in the sea," or ocean currents; the motions of the sea or tides; the depth of the



TEACHER'S ILLUSTRATION.

ocean, said to correspond with the greatest heights of the continents, and we may find sufficient for long and interesting talks on the seashore.

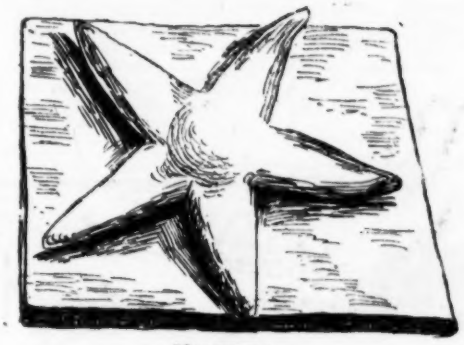
The picture represents a simple seaside scene, and should be drawn in coloured chalks on the blackboard before the lesson begins.

Painting.—This exercise is done by means of brush strokes or brush manipulation; it represents the common whelk shell.

PAINTING.

Use any suitable colour, as burnt sienna or orange chrome. Show the children a finished painting, and the shell form if possible. Paint it stroke by stroke with the class; do not outline. The cockle shell is done by first drawing the outline, and then with the brush making strokes to show the inequalities of surface.

Modelling.—A star-fish. To model this object, first make a slab of clay after the method previously described last month. About ¼lb. of clay for each child will be required. The teacher should have made a finished model before the lesson begins; and she must also help the children, as the work proceeds, by drawings on the board. Make a ball of clay, and then flatten it gradually by pressure between the hands and on the modelling board, but use the latter as little as possible, as much pressing will cause the clay to stick to it and spoil the work. When the clay has been flattened to about the thickness of ½ of an inch, lay it down and mark five points; between these points cut out triangular pieces *towards*, but not reaching to, the centre. The upper side of the model should be raised slightly to avoid the appearance of something perfectly flat, and the sides where the clay has been cut should also be rounded off, and not left clean cut.



MODELLING.

II.—SKETCH OF A LESSON ON WAVES AND THEIR WORK.

Required for the Lesson.

Map of England, specimens of hard and of soft, easily crumbled stones; also pebbles and sand.

Preparation.

Let the children discuss the previous lesson on the sea, and point out to their notice how the waves constantly rise and fall. Compare with the undulatory movement of a field of corn when the wind is blowing.

Presentation.

I. Waves.—As it is impossible for little children to understand clearly the significance of the term "waves," the teacher should merely give a very general idea (by blowing on the surface of a dish of water) of the action of the wind on the sea, and after picturing the appearance of the waves, pass on to the work they accomplish.

II. How waves eat away the land.—Let the children picture the waves dashing against the land. Explain how the earth is loosened, and how huge boulders are torn down, to be used as missiles by the waves in the further destruction of the land. What kind of land will be worn away the soonest? What will be the effect on those parts of the coast which are harder than others? Show a sketch, and describe how caves are formed. Show how large stones get broken up into small pieces, and in time lose their sharp corners by being constantly rolled about. Such are then known as pebbles. These, in the same way, are ground down into shingle, and eventually into the sand or the fine mud which is to be found at the seaside.

III. How new land is made.—Explain that, although the waves are constantly breaking down and wearing away the land, this is compensated for by the formation of new land through the agency of the sea. Show how the sea, as it were, stores up the waste material robbed from the land, and deposits it perhaps in the form of a sandbank, or casts it up on a low-lying shore, to form in the course of time new beds of rock. Refer to and point out on the map examples of the above—for example, the wearing away of the Yorkshire coast and the gradual gain of new land on some parts of the coast of Lincolnshire.

Association.

Associate with the wearing away of the land by a river.

Formulation.

The force of the waves breaks down and wears away the land; but this material so obtained is not wasted, but deposited elsewhere, to build up in the course of time new land.

Application.

See occupations.

EXPLANATION OF ILLUSTRATIONS.

Teacher's illustration.—This can be well reproduced on the blackboard simply by a white chalk sketch. It shows the hollowing out of rocks and coast line by the action of water. It will answer well also for the drawing lesson.

Painting.—Seaweed. This may be done by simple brush strokes. Use sepia. First do the branchings where no blobs occur. In the case of the branchings where the blobs or eyes occur do these latter first, and then carefully paint round, leaving

TEACHER'S ILLUSTRATION.

a fine white line to mark the thicker parts. A piece of dried seaweed attached to the blackboard will help in the execution of the work.

PAINTING.

Modelling.—A shell. This model affords a good exercise in manipulation by means of the hand. A ball may first be modelled, which should be rolled into a thick cylinder; then lengthen this out by rolling round with the hands to form the spiral, keeping the upper part thick. Gradually bend over one side, and make an indentation with the thumbs. Two ounces of clay would be sufficient; no tool is required.

MODELLING.

III.—SKETCH OF A LESSON ON RIVER-SIDE BIRDS.

Required for Lesson.

Any specimens, such as old nests, feathers, eggs, etc., which the teacher may be able to obtain; also sketches of the various birds.

Preparation.

Let the children give brief accounts of any birds they know, and any characteristics of bird life they may have noted. Tell them they are going to consider the peculiarities of birds which are to be found about the river-side.

Presentation.

I. Birds that perch.—Explain to the children what is meant by a percher, and point out how such may be recognised. Describe two or three of the best known varieties found about the water-side.

(*a*) *The kingfisher.* Point out that this bird is about the size of a sparrow, but gaily coloured, with green head and wings, a red breast, and blue body. Its beak is long and black, and its tail very short. Why is the beak long and sharp-pointed? Describe the habits of the bird, how it gets its food, and the nature of that food. Tell the class about the nest it digs in the bank, a nest with a floor of fish bones through which any water that gets in can drain away.

(*b*) *The reed-warbler.* Describe the way this bird perches on the reeds when watching for its food, and refer to the nest which it weaves round two or three reeds and then lines with water-weed.

(*c*) *The water-wagtail.* Tell about the restless little bird known as the water-wagtail. Its nest is found in the banks of a stream. How does the bird get its name?

II. Birds that wade.—(*a*) *The heron.* Let the children examine the sketch of a heron, which may be taken as a typical wader. Why are its legs very long and slender? Why are there no feathers on them except close to the body? Why are the neck and bill so long? Would a short neck be suitable? Let the children tell what the heron's food will be (fish, worms, etc.).

(*b*) *The water-hen.* Tell the children about the common water-hen and its shy relative the coot, which are about the size of a pigeon, and in appearance black with white-tipped wings. (Refer to Tennyson's "Brook," line 1.) The water-hen's nest is found among the rushes growing in the water. Of what will it be made?

III. Birds that swim.—(*a*) *The duck.* Give a brief account of the wild duck and its relatives which live near lakes and streams.

(*b*) *The seagull.* Tell the class about the seagulls which are often to be found near the mouths of rivers. Show how these birds are adapted for a life to be passed mostly on the water.

Association.

Associate with the ordinary birds of the field.

Formulation.

River birds, although in many ways very similar to other birds, have peculiarities necessary for the different conditions under which they live.

Application.

See occupations.

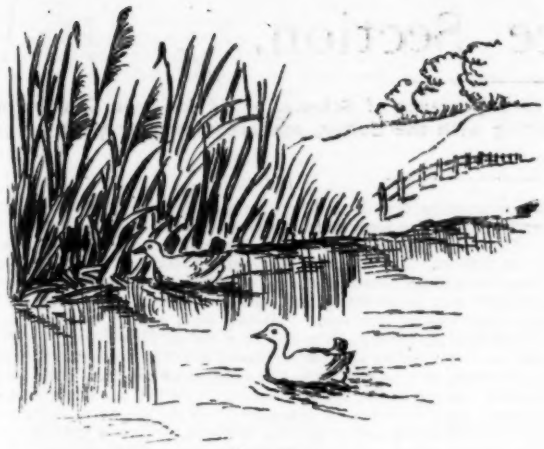
EXPLANATION OF ILLUSTRATIONS.

Teacher's illustration.—This picture, showing the kingfisher sitting watching for his prey and the martins flying overhead, may well introduce the lesson, and form also a subject for drawing.

TEACHER'S ILLUSTRATION.

Painting.—This picture may be done simply in sepia or in three colours—pale blue, green, and a touch of brown. If three colours are used, proceed as follows: Wash the river a very watery blue, darken a little towards the edges by some extra touches. Paint the leaves of the reeds green and the rushes brown. A touch of green for the distant hill and also for the trees, with a brown fence and brown birds, will complete. The birds should not be painted till the wash for the water is quite dry.

Modelling.—Water-bird's nest. This fairly represents the kind of nest usually made by water birds, such as swans. These usually sit on the bank near the water, and build the nest in some



PAINTING.

such way as this round themselves. It is modelled by rolling some pieces of clay into cylindrical pieces, and arranging them by building up in a crosswise direction all round.

MODELLING.

IV.—SKETCH OF A LESSON ON THE DUCK.

Required for Lesson.

A few feathers, some down, a duck's egg, picture of a duck.

Preparation.

The teacher might let the children describe the general build, habits, and food of the hen; and then, in the course of the lesson, lead them to see wherein the duck differs, and the reasons for these differences.

Presentation.

(*a*) *Shape.* Call the attention of the children to the general appearance of the duck. Point out the resemblance of the body to a little boat, and contrast with the differently shaped body of the hen.

(*b*) *Feathers.* The children will all know that the duck is covered with feathers. Draw their attention to (1) the different kinds of feathers, varying from the thick, fluffy covering of down next the skin to the large primary feathers of the wing. (2.) Explain how the down feathers act as a sort of blanket to the bird by preventing the heat of the body from escaping. This keeps the duck warm when in the water. (3.) Let the children describe how the feathers are arranged. Compare with the way the slates are placed (one overlapping the other) on the roofs of houses. What is the advantage of the duck's feathers being so arranged? (4.) Refer to the oil with which the duck preens its feathers. Of what use is this oil?

(*c*) *Neck.* Draw the attention of the children to the neck of the duck. Why is it so long and flexible? Contrast with the neck of the hen.

(*d*) *Beak.* Let the children observe the broad, flat beak. Point out the delicate skin on the outside, and the fringe on the inside, of the beak, and let them find out of what use they are to the bird.

(*e*) *Legs.* Question as to the position of the duck's legs. Why are they so placed? Contrast the awkward waddle of the bird when on land with its graceful appearance on the water.

(*f*) *Feet.* Let the children note the differences between the foot of the hen and that of the duck. Refer to the tough skin between the toes in the case of the latter, and compare the action of the foot (the opening and closing of the web) with the blade of an oar when dipped into the water and then raised.

(*g*) *The duck's egg.* Contrast the size and colour with that of the hen.

Association.

Let the class summarise the points of likeness and of difference between the hen and the duck.

Formulation.

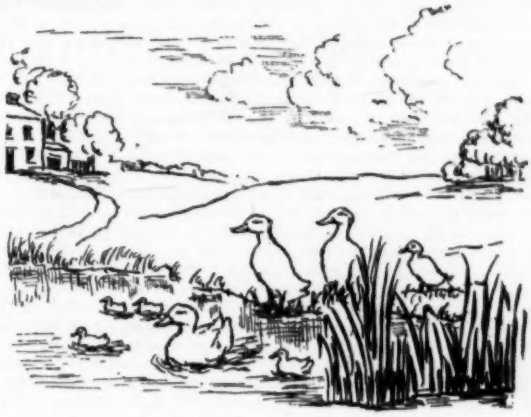
The duck has a boat-shaped body, long neck, flat beak, and webbed feet, all of which are necessary to enable it to live and feed on either land or water.

Application.

See occupations.

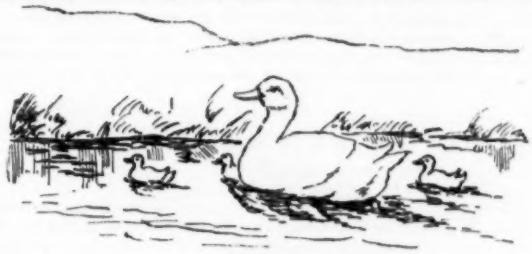
EXPLANATION OF ILLUSTRATIONS.

The teacher's illustration is one easily drawn on the blackboard: a simple farmhouse scene, showing young ducks taking to the water.



TEACHER'S ILLUSTRATION.

Painting.—Pond with ducks and ducklings. Colours brown and green would do for this. Paint the distant outline faint green, also the herbage on the far side of the pond. The water



PAINTING.

may also be very pale green and the ducks brown. A touch of yellow for the bill of the duck will improve it, and if the yellow is in use paint the ducklings this colour also.

MODELLING.

Modelling.—A duck's egg. This is not so easy as one might think. It is, of course, easy to model one of a kind, but a perfect specimen is rare. Model the sphere first, and obtain the egg or oval form by gradual working with the hands.

Our Science Section.

☞ **Subscribers requiring Explanations of Difficulties in any branch of Science, or Advice upon Courses of Study, can obtain all help required by communicating with the Editor, and accompanying their query with the Coupon cut from this number.**

NOTES ON PHYSICS.

BY EDWIN EDSER, A.R.C.SC.,
Author of "Heat for Advanced Students," "Light for Students," "Differential and Integral Calculus for Beginners," etc.

Determination of the Mass of the Earth.—The mass of the earth is a physical constant of the greatest importance, for when it is known the masses of the sun, moon, and planets can be calculated from astronomical data. On the other hand, nothing at first sight appears more impossible than the "weighing of the earth;" for we obviously cannot compare its mass with that of any known quantity of matter in the manner that we would use if we wished to determine the mass of, say, a piece of metal. Nevertheless, the earth has been weighed; and the method used in doing this will now be described.

Newton pointed out that since light and heavy bodies fall to the earth (in the absence of air friction) in equal times, it follows that the attraction exerted by the earth on any body at a given position is proportional to the mass of the attracted body. But action and reaction are equal and opposite; therefore the attraction exerted by a body on the earth is proportional to the mass of the body, and if we assume that each particle of the body attracts every particle of the earth, just as each particle of the earth attracts every particle of the body, it becomes evident that the attraction exerted by the body on the earth is proportional to the mass of the earth: that is, if a given body were placed in turn at equal distances from the centre of the earth and that of another planet, the attractions exerted on the body would be in the ratio of the mass of the earth to the mass of the planet. We may generalise this result by stating that if two spherical bodies are placed in the neighbourhood of each other, then the attraction exerted by one body on the other is proportional to the product of the masses of the bodies. Thus, if f represents the attractive force exerted by a body of mass m_1 on another of mass m_2, then

$$f \propto m_1 m_2.$$

The above law only applies when the distance between the spheres, measured from centre to centre, is constant. From an analysis of astronomical data, Newton arrived at the law that the attraction varies inversely as the square of the distance d measured from centre to centre of the spheres. Thus we may express the fundamental law of the attraction exerted by one spherical mass of matter on another in the form

$$f \propto \frac{m_1 m_2}{d^2}.$$

This can also be written in the form

$$f = G\frac{m_1 m_2}{d^2}, \quad \ldots\ldots\ldots \quad (1)$$

where G is a constant called the *Newtonian constant of gravitation*. If m_1 and m_2 were each equal to 1 gram, and if d were 1 centimetre, then f would become equal to G. Thus *the Newtonian constant of gravitation G is equal to the attraction that would be exerted by a sphere of one gram mass on another sphere of equal mass when the distance between the spheres, measured from centre to centre, is equal to* 1 *centimetre.*

The importance which attaches to the determination of the value of G is easily understood; for we know the radius of the earth, and we also know that a gram of matter placed on the surface of the earth is attracted with a force of 981 dynes: hence in equation (1), if we substitute $m_2 = 1$ gram, $d =$ the radius of the earth, and $f = 981$ dynes, and insert the value of G, then the only unknown quantity is m_1, which will represent the mass of the earth. Hence to determine the mass of the earth, we must measure the attraction exerted by a spherical mass of matter on another similar mass, the value of the two masses and the distance between their centres being known. This result will enable us to determine G; and when this constant is known, the mass of the earth can be calculated.

An experimental method of determining G was planned by the Rev. John Michell, who constructed the necessary apparatus, but died before he could carry out the experiment. Subsequently the apparatus came into the hands of Cavendish, who succeeded in completing the determination of G with apparatus of his own making, but essentially similar to that made by Michell.

The principle underlying the Michell-Cavendish experiment is as follows. Let a light but rigid wooden rod be suspended from its middle point by means of a wire, so that the rod can oscillate in a horizontal plane, and let a sphere of lead be fixed to either end of the rod. (Michell used leaden spheres each 2 inches in diameter, at the end of a rod 40 inches long.) Now let two large leaden spheres be placed near the spheres attached to the rod, so that the attractions exercised on these both tend to turn the rod in the same direction. (Michell used two leaden spheres each 8 inches in diameter.) If m_1 grams is the mass of one of the suspended spheres, while m_2 grams is the mass of the sphere which attracts it, the distance between the two, measured from centre to centre, being d, then the force (in dynes) exerted on either sphere is given by the equation

$$f = G\frac{m_1 m_2}{d^2},$$

and the torque (or turning moment) exerted on the suspended system will be equal to

$$fD = GD\frac{m_1 m_2}{d^2}, \quad \ldots\ldots\ldots \quad (2)$$

where D = the distance from centre to centre of the two spheres at the ends of the rod.

As a result of the application of this turning moment, the rod will turn through an angle θ (say). If each of the attracting spheres is now placed on the opposite side of the suspended sphere which it attracts, the rod will turn through an equal angle θ in the opposite direction. In practice the angle 2θ was measured by observing an ivory scale placed near one end of the rod by means of a telescope with cross wires in the eyepiece, first when the rod was rotated in one direction, and afterwards when it was rotated in the opposite direction.

Now the moment of inertia I of the suspended system can be determined in the manner explained in the June number of the *Practical Teacher;* and when I is known, the value of τ, the torque which will produce unit twist (that is, a twist of one radian), can be calculated from the formula

$$T = 2\pi\sqrt{\frac{I}{\tau}},$$

where T is the time of vibration of the suspended system. Further, the opposing torque called into play when the suspended system is rotated through θ radians (as in the experiment described above) will be equal to $\theta\tau$, and this must be equal to the applied torque fD given in equation (2); therefore

$$\theta\tau = GD\frac{m_1 m_2}{d^2}, \quad \ldots\ldots\ldots \quad (3)$$

and the only unknown quantity in this equation is G, the Newtonian constant of gravitation, which can therefore be calculated.

The Cavendish experiment has in recent times been repeated by Reich, Baily and Cornu and Baille, and lastly by Professor Boys. Professor Boys re-performed the experiment on a scale much smaller than that previously used, the attracted spheres being of gold only 0·2 inch in diameter, suspended at a distance of 0·9 inch apart; the suspended system was hung from a quartz fibre 17 inches long. By this means greater freedom from convection currents was obtained than could be hoped for when larger apparatus was used. Professor Boys found that

$$G = 6{\cdot}6576 \times 10^{-8}.$$

When the mass of the earth has been calculated from the value determined for G, the average density Δ of the earth can be calculated by dividing its mass by its volume. Professor Boys found that

$$\Delta = 5{\cdot}5270,$$

while the value of the same constant, as determined by Cavendish, is 5·448. It should be noticed that this value is greater than the average density of the substances found near the surface of the earth, which is somewhere near 2·5; hence we must conclude that the interior of the earth is composed of matter which is much more dense than that near the surface.

The value of G has been determined by Professor Poynting

by another method. Two lead spheres, each weighing 50 lbs., were hung at the opposite ends of the beam of a balance, and another leaden sphere weighing 350 lbs. was alternately placed under one and the other of the suspended spheres. In this way the beam of the balance was tilted first in one direction and then in the other, and the tilt produced in this manner was compared with that produced by adding 0·4 milligram to one of the scale pans. Poynting found that

$$G = 6{\cdot}6984 \times 10^{-8}.$$
$$\bar{\Delta} = 5{\cdot}4934.$$

To Calculate the Mass of the Sun.—Let us assume that the earth revolves in a circular orbit of radius r; then the centrifugal force due to its motion with velocity V in this orbit is equal to

$$\frac{mV^2}{r},$$

where m is the mass of the earth. The gravitative attraction exerted by the sun (of mass M) on the earth is equal to

$$G\frac{Mm}{r^2},$$

and this must be equal to the centrifugal force due to the earth's motion; therefore

$$G\frac{Mm}{r^2} = \frac{mV^2}{r}.$$

$$\therefore M = \frac{rV^2}{G},$$

whence M may be calculated.

Problem 1. Calculate the mass of the earth, being given that the mean radius of the earth is 3,960 miles, or $6{\cdot}37 \times 10^8$ cms. (1 ft. = 30·5 cms. nearly.) Force of gravity on 1 gram near surface of earth = 981 dynes.

Answer. Mass of earth = 6×10^{27} grams, or 6×10^{21} tons approximately. (1 ton = 10^6 grams nearly.)

Problem 2. Calculate the mass of the sun, being given that the mean radius of the earth's orbit = $92{\cdot}8 \times 10^6$ miles.

Answer. Mean radius of earth's orbit = d

$$= 92{\cdot}8 \times 10^6 \text{ miles}$$
$$= 1{\cdot}49 \times 10^{13} \text{ cms.}$$

Circumference of earth's orbit = $6{\cdot}28 \times 1{\cdot}49 \times 10^{13}$ cms.

$$= 9{\cdot}38 \times 10^{13} \text{ cms.}$$

Number of seconds in a year = $365 \times 24 \times 3600$

$$= 3{\cdot}16 \times 10^7.$$

$\therefore$ velocity V of earth = $2{\cdot}97 \times 10^6$ cms. per sec.

Hence mass of sun = $M = \dfrac{1{\cdot}49 \times 10^{13} \times (2{\cdot}97 \times 10^6)^2}{6{\cdot}65 \times 10^{-8}}$

$$= 1{\cdot}97 \times 10^{33} \text{ grams}$$
$$= 1{\cdot}97 \times 10^{27} \text{ tons.}$$

CHEMISTRY.

(ADVANCED AND HONOURS.)

BY C. A. WEST, B.SC., A.R.C.S., F.I.C.

Change of Weight in Chemical Reactions.—During the past thirteen years a large number of experiments have been carried out with great care by H. Landolt, A. Heydweiller, and others, with the view of determining whether, in chemical reactions, the total weight of the reacting substances remains quite unchanged or undergoes appreciable alteration. As a general result, it was found that in the majority of cases there was a diminution of weight, which was frequently greatly in excess of the error of weighing. In order to determine whether this diminution of weight was due to experimental errors, or stood in real connection with the chemical change (owing, for example, to the escape of electrons or to a loss of material as in radio-active change), further experiments were undertaken by H. Landolt with such care that the greatest error attaching to an experiment is only $\pm$ 0·03 mg. As the total mass amounted to between 300 and 500 grams, the experimental error is only about one part in ten millions. Besides the ∩-shaped glass vessels formerly employed, similar vessels of quartz have been used in a few cases, and also vessels consisting of a beaker enclosed in a bulb surrounded by a vacuum mantle. Glass vessels coated internally with paraffin wax were also employed in order to exclude any possible permeability of the vessel due to minute cracks or air-bubbles in the glass. The reactions studied and the results obtained are given in the following table:—

Reaction.	Remarks.
$Ag_2SO_4 + 2FeSO_4 = 2Ag + Fe_2(SO_4)_3$. $3AgNO_3 + 3FeSO_4 = 3Ag + Fe_2(SO_4)_3 + Fe(NO_3)_3$.	In most cases a diminution of weight, exceeding the experimental error, the diminution being to a certain extent proportional to the mass of reacting substance. The diminution of weight was not observed, or was only slightly greater than the experimental error, when the vessel was coated internally with paraffin.
$Fe + CuSO_4 = Cu + FeSO_4$.	In neutral and alkaline solutions no certain change.
$AuCl_3 + 3FeCl_2 = Au + 3FeCl_3$.	No change.
$HIO_3 + 5HI = 6I + 3H_2O$.	Always diminution in weight in most cases to an extent exceeding experimental error.
$2I + NaHSO_3 + H_2O = 2HI + NaHSO_4$.	In most cases no appreciable change.
$2UO_2(NO_3)_2 + 6KOH = K_2U_2O_7 + 4KNO_3 + 3H_2O$.	No change.
Electrolysis of an aqueous solution of CdI_2, with alternating current of 3 ampères for forty hours.	
Solution of ammonium chloride, potassium bromide, chloral hydrate in water.	
Precipitation of copper sulphate from its aqueous solution by alcohol.	

Considering the results so far obtained by Landolt and by Heydweiller, it is found that diminution of weight occurs in 61 out of 75 cases, so that this behaviour appears to be the normal one; any increase of weight which was found was always within the experimental error. The explanation of this behaviour Landolt seeks in the breaking up of the atoms on chemical change, and in the escape of sub-atomic particles through the walls of the vessel. The diminution of weight does not appear to be due to the escape of electrons.

Structure of Atoms.—Assuming the atom of an element to consist of a number of negative electrons in a sphere of uniform positive electrification, J. J. Thomson has investigated the theory of the dispersion of light, the scattering of Röntgen radiations, and the absorption of β-rays by gases. All three lines of investigation lead to the conclusion that the number of corpuscles in the atom is of the same order as the atomic weight of the element; whilst from the first method of investigation it is concluded that the mass of the carrier of unit positive charge is large compared with that of the carrier of unit negative charge. The data at present available indicate that the number of corpuscles in the atom is equal to the atomic weight; but as the evidence is rather indirect, and the experimental data not very numerous, further investigation is necessary before one can be sure of the equality. The evidence seems, however, sufficient to establish the conclusion that the number of corpuscles is not greatly different from the atomic weight.

Argon and Helium in Springs.—The examination of the gaseous contents of forty-three thermal springs has revealed the general presence in these gases of argon and helium, the proportion of which varies with the amount of nitrogen and indirectly with the amount of carbon dioxide. In the water of Mazières the new gases formed 6·35 per cent. of the nitrogen.

Olszewski, working with helium obtained from thorianite, has not been able to liquefy this gas, even when it is cooled by frozen hydrogen and submitted to a pressure of 180 atmospheres, which was suddenly reduced to one atmosphere. In this way the temperature was lowered to $-271{\cdot}3°$. The boiling-point of helium is therefore estimated to be below $-271°$.

The densities of the vapours of zinc, cadmium, mercury, sulphur, selenium, and arsenic have been determined in atmospheres of argon and of helium, and compared with the values obtained when atmospheres of nitrogen and of hydrogen are employed. From the results of these observations, it is concluded that these elements exhibit a tendency to unite with argon and helium.

A New Oxide of Carbon.—A discovery of considerable interest and importance is that of a new gaseous oxide of carbon, which Diels and Wolf have found amongst the products of the decomposition of ethyl malonate by phosphorus pentoxide at 300°. Its composition is represented by the formula C_3O_3; it is combustible, burning with a blue, smoky flame to form carbon dioxide. By its reaction with water, ammonia and hydrochloric acid, malonic acid, malonamide and malonyl chloride are formed.

To the name carbon suboxide, proposed by its discoverers, Berthelot objects, as that name has been already appropriated for compounds discovered by Brodie in 1873, and examined by Berthelot himself. The constitutional formula O:C:C:C:O has been assigned to this substance, but Michael considers it to be the lactone of β-hydroxypropiolic acid, for which the formula is suggested.

Volatility of Metals.—The volatility of iron is established by Moissan, who has succeeded in distilling this and several other metals by heating them in an electric furnace, and in this manner obtaining crystalline distillates. The metals nearly allied to iron decrease in volatility in the following order—manganese, nickel, chromium, iron, uranium, molybdenum, and tungsten. Further, Moissan also finds that the metals indium, osmium, palladium, platinum, rhodium, and ruthenium, when heated in carbon crucibles in an electric arc produced by 500–700 ampères at 110 volts, are all fused and boil, giving distillates consisting of spherules or microscopic crystals. Palladium melts more readily than platinum, whilst of these metals osmium is the most difficult to distil.

Rusting of Iron.—Moody has considered the previous work on this subject, and from this and his own investigations gives the reason for the rusting of iron. His conclusions seem to be supported by satisfactory experimental evidence. The rusting is due to the influence of carbon dioxide; neither water nor oxygen free from this gas has the slightest effect. A trace of carbon dioxide suffices to start the action, and freshly-formed rust always contains some ferrous carbonate, which is readily attacked by oxygen. Hydrogen peroxide, when pure and free from acid, has no action on metallic iron.

The Electronic Theory of Matter.—It may be stated without fear of contradiction that the theory that the atom is made up entirely or to any substantial extent of electrons is now generally regarded as being very much open to question. From spectroscopic and other evidence it is certain that electrons are universal constituents of atoms; but for the further very sweeping deduction that the atoms are composed of electrons there never has been much positive evidence in the past, whilst against the view some definite experimental evidence can now be urged. It is interesting to note that Professor J. J. Thomson, to whom the electronic theory of matter is largely due, has himself recently brought forward considerations which have practically made the theory untenable.

The view that the β-ray electrons do not in their passage through matter diminish continuously in speed, but proceed more or less unaffected until they are suddenly stopped or turned through a large angle to reappear as secondary radiation, bears upon the present question. Considering the enormous number of atoms a β-ray electron can penetrate without being greatly affected, and the certainty that the approach of the radiant electron to an electron in an atom must result in deviation or loss of velocity of the former, it becomes extremely difficult to believe in the reality of the view that the atom is substantially constituted of swarms of electrons in regular motion. The penetrating power of the β-ray electron was one of three methods developed by J. J. Thomson to determine the number of electrons in an atom, each of which led to the result—the importance of which cannot be over-estimated—that the number of electrons in any atom is of the same order as, and probably equal to, the atomic weight in terms of hydrogen as unity, a conclusion which practically leaves the whole problem of the ultimate constitution of matter where it was, and which is in sharp conflict with the electronic theory of matter, which assumed a number of electrons a thousand times greater. The two other methods of attacking the question depended, the one on the scattering of Röntgen rays by gases, for which the work of Barkla on the ratio of the energy scattered to that in the primary radiation furnished the required data, and the other on the dispersion of light by gases.

In the latter method a light wave is considered crossing the atom, and subjecting it to the action of the electric field in the wave-front for a period which is longer the longer the wave-length of the light. This field affects the displacement of the positively and negatively charged parts of the atom in opposite directions, polarising the atom and increasing the refractive index of the medium. This polarisation and increase of refractive index will in general be the greater the longer the wave-length causing dispersion, and the amount depends upon the relative masses of the positive and negative parts of the atom.

For the mathematical development of these three methods the original paper must be consulted. The result that all but about one-thousandth of the mass is associated with the positive part of the atom shows that an altogether exaggerated *rôle* has been attached to the electron in the constitution of matter.

PHYSIOGRAPHY.

(STAGES 2 AND 3.)

TERRESTRIAL MAGNETISM (*continued*).—In England, if a free magnetic needle is supported at its centre of gravity, it will set itself in a direction which makes an angle of about fifteen degrees with a line pointing directly north and south. At the same time the needle does not set itself in a horizontal plane, but the north-seeking pole dips downwards at an angle of about sixty-seven degrees. It is, however, not an easy matter to support a needle in such a way that it can move freely in any direction, and it is usual to mount needles so as to give them freedom of movement either in a horizontal plane or in a vertical plane, but not in both.

Take a strip of steel ribbon pointed at both ends, and balance it on the edge of a knife so as to find its middle point. Drill a small hole in the centre, and through this place a piece of glass tube drawn off and rounded at one end so as to form a cap. Now fix a sewing-needle in a piece of wood so that it stands vertically with its point upwards, and on this support the needle just made by means of the glass cap. If the needle does not set itself horizontally, file a little off the heavier end until it does so. After having balanced it in this way, magnetise it by rubbing it along the direction of its length with the pole of a strong magnet. When it is replaced on the sewing-needle pivot it will be found that the needle sets itself roughly north and south, but that the north-seeking end dips somewhat. This end should now be lightened by filing a little off until it rests in a horizontal plane. This needle will now remain horizontal so long as it is kept in the same place, but it is found that if such a needle is carried a considerable distance to the north or south, one end begins to dip downwards appreciably.

We have said that the needle points roughly north and south. It is of importance to observe the deviation of this direction from the true north and south, and to understand some terms used in connection with it. The vertical plane passing through the two poles of a freely suspended needle is spoken of as the *magnetic meridian*. This plane should obviously also pass through the north and south magnetic poles. By the *geographical meridian* of a place we mean the imaginary vertical plane passing through the place and the north and south geographical poles. The angle which the magnetic meridian makes with the geographical meridian is called the *angle of declination*.

The declination is said to be to the east or to the west, according as the north pole of the needle points to the east or west of the geographical meridian. The angle of declination varies with the position in the earth's surface. In Europe and Africa the declination is west, while in a great portion of Asia it is east.

If a magnetic needle is supported in a vertical plane on a horizontal axle passing through its centre of gravity, and is placed so that the horizontal axis is at right angles to the magnetic meridian, it is found that the needle makes a definite angle with the horizontal. This angle is called *the angle of dip or inclination*. This angle varies in different positions on the earth's surface. In London this angle is about sixty-seven degrees, but, like the angle of declination, it varies with time. In the year 1800 A.D. it was about seventy degrees in London.

We will now study the variations in the directions taken up by the declination needle and the dip needle as they are moved from place to place on the earth's surface.

We will first consider the declination needle. In England we find that it points about sixteen degrees to the west of the geographical meridian. If the needle is carried to the east across Europe, the angle of declination decreases, until in Central Russia it becomes zero—that is, in this particular position the compass needle points due north and south, or, in other words, the magnetic and geographical meridians coincide. Having come to this position, the needle may be taken north or south in such a direction that the needle always points directly north and south. In this way we may determine a line of points on the earth such that at any position on this line the declination is zero. This line passes through Central Russia, the Caucasus, the Persian Gulf, the Indian Ocean, and Western Australia to the Antarctic regions. If we trace it northwards, it passes through the north of Russia, across the north geographical pole, across the north magnetic pole situated in Boothia Felix, and then southwards through Hudson Bay, Canada, the eastern states of the United States, into the Atlantic, and then across the eastern portion of South America, and on to the Antarctic regions. This line of no declination is called the *agonic line*. As we have seen, it runs roughly north and south, and corresponds somewhat to a line of longitude. In addition to this line of no declination we may plot other lines on the earth's surface such that any one line joins places having the same angle of declination. These lines correspond in a rough sort of way to the lines of longitude

on an ordinary geographical map, but they are not nearly so regular. We call them *isogonic lines* or *isogonals*.

In the same way we can deal with the dip needle. Near the equator the dip needle settles practically in a horizontal position. If we draw a line round the earth, joining all places where the angle of dip is zero, we get a line which we might call the magnetic equator of the earth; and it does actually go round the earth without at any time going farther from the geographical equator than twenty degrees. This line is called the *aclinic line*. We may similarly plot lines joining places of equal dip, and we find that most of these run roughly parallel with the aclinic line, and correspond somewhat with the parallels of latitude. These lines are called *isoclinic lines*.

MATHEMATICS.

(STAGES 2 AND 3.)

BY FRANK CASTLE, M.I.M.E.

It is proposed in the following series of "Notes" to give as much assistance as space will permit to those readers who are chiefly concerned with the examinations of the Board of Education or other examinations of a like character.

It may be taken for granted that the reader will have access to some of the numerous books on the various sections of algebra, Euclid, and trigonometry, and hence it will not be necessary in these notes to insert what may be described as mere bookwork, but merely to indicate from time to time the more important sections of the various subjects, which may be obtained from any text-book on the subject. In this manner it will be possible to deal more fully and effectively with those portions in which assistance will probably be required.

It is a well-known fact that a student may read and apparently understand a certain amount of bookwork, and yet be quite unable to solve readily a fairly easy question such as is met with in an examination paper. As such questions are of the utmost value in testing a student's knowledge of the subject, those given in these notes from time to time will, with some few exceptions, be taken from previous examination papers; and to facilitate reference, the year in which they were given will be inserted in brackets. Thus (1903) at the end of a question indicates that the question to which it is attached was set in the year 1906. In the questions referred to some typical cases will be fully worked out to indicate convenient methods which may be used to obtain the requisite solutions; in addition, others will be given as exercises, together with their numerical answers.

It will obviously be impossible to anticipate all the difficulties which may be experienced; hence in any case of difficulty the reader is advised to write to the Editor of the *Practical Teacher* enclosing the coupon from the cover.

Simplifications and Square Roots.—The process of the simplification of a given expression is frequently readily effected by means of factors; hence for this and other important sections, such as the extraction of square root, solution of a given equation, etc., it is of the utmost importance that familiarity with the factors of at least simple expressions should be obtained. Thus it should be possible to write down by inspection the factors of such expressions as $x^2 - 5x + 6$; that is, the first term of each factor is x, the second term is such that the sum of the two numbers is 5 and product 6. Hence 3 and 2 are the numbers required. $\therefore x^2 - 5x + 6 = (x - 2)(x - 3)$.

Similarly in $x^2 + x - 30$ the sum of the two numbers is 1 and product -30, hence 6 and -5 are the numbers, and

$$x^2 + x - 30 = (x + 6)(x - 5).$$

Ex. 1. Extract the square root of

$$x(x^3 - 64) + 8(x^3 + 8). \qquad (1899.)$$

Multiplying out and arranging, we obtain

$$x^4 + 8x^3 - 64x + 64 \,\big(x^2 + 4x - 8$$

$$\begin{array}{r|l} x^4 & \\ \hline 2x^2 + 4x & 8x^3 - 64x \\ & 8x^3 + 16x^2 \\ \hline 2x^2 + 8x - 8 & -16x^2 - 64x + 64 \\ & -16x^2 - 64x + 64 \end{array}$$

Hence the square root required is $x^2 + 4x - 8$.

Ex. 2. Extract the square root of

$$(3x^2 - 11x + 6)^2 + 12x(3x - 2)^2. \qquad (1900.)$$

The factors of $3x^2 - 11x + 6$ are $(3x - 2)(x - 3)$. Hence the given expression becomes

$$(3x - 2)^2\{(x - 3)^2 + 12x\}, \text{ or } (3x - 2)^2(x + 3)^2.$$

$\therefore$ square root required is $(3x - 2)(x + 3)$.

Ex. 3. Extract the square root of

(a) $x^{12} - 8x^9 + 18x^6 - 8x^3 + 1$.

(b) $x^2 + x + 1 - \sqrt{(2x^3 + x^2 + 2x)}$. (1899.)

(a)

$$x^{12} - 8x^9 + 18x^6 - 8x^3 + 1 \,\big(x^6 - 4x^3 + 1$$

$$\begin{array}{r|l} x^{12} & \\ \hline 2x^6 - 4x^3 & -8x^9 + 18x^6 \\ & -8x^9 + 16x^6 \\ \hline 2x^6 - 8x^3 + 1 & 2x^6 - 8x^3 + 1 \\ & 2x^6 - 8x^3 + 1 \end{array}$$

Hence square root required is $x^6 - 4x^3 + 1$.

(b) Let $\sqrt{\{x^2 + x + 1 - \sqrt{(2x^3 + x^2 + 2x)}\}} = \sqrt{x} - \sqrt{y}$, then squaring both sides of the equation, we obtain

$$x^2 + x + 1 - \sqrt{(2x^3 + x^2 + 2x)} = x + y - 2\sqrt{xy}.$$

Thus $x + y = x^2 + x + 1$, ... (1)

and $-2\sqrt{xy} = \sqrt{(2x^3 + x^2 + 2x)}$. . . . . (2)

Squaring (1), then $(x + y)^2 = x^4 + x^2 + 1 + 2x^3 + 2x^2 + 2x$.

Squaring (2), then $4xy = 2x^3 + x^2 + 2x$.

By subtraction, $x^2 - 2xy + y^2 = x^4 + 2x^2 + 1$.

$$\therefore x - y = \sqrt{(x^4 + 2x^2 + 1)} = x^2 + 1.$$

$$\therefore x + y = x^2 + x + 1,$$

and $x - y = x^2 + 1$.

By addition, $x = 2x^2 + x + 2 = x^2 + \frac{x}{2} + 1$.

By subtraction, $y = -\frac{x}{2}$.

Hence $\sqrt{\{x^2 + x + 1 - \sqrt{(2x^3 + x^2 + 2x)}\}}$

$$= \sqrt{x^2 + \frac{x}{2}} + 1 - \sqrt{\frac{x}{2}}.$$

Ex. 4. Show that

$(b - c)^2(c - a)^2 + (c - a)^2(a - b)^2 + (a - b)^2(b - c)^2$ is a perfect square. (1907.)

Let $x = b - c$, $y = c - a$, and $z = a - b$.

Then $x + y + z = b - c + c - a + a - b = 0$.

Squaring, $x^2 + y^2 + z^2 + 2(xy + yz + xz) = 0$,

or $x^2 + y^2 + z^2 = -2(xy + yz + xz)$.

Again squaring,

$$(x^2 + y^2 + z^2)^2 = 4\{(x^2y^2 + y^2z^2 + x^2z^2)\} + 2xy(x + y + z)$$

$$= 4(x^2y^2 + y^2z^2 + x^2z^2), \text{ since } x + y + z = 0.$$

$$\therefore x^2y^2 + y^2z^2 + x^2z^2 = \left(\frac{x^2 + y^2 + z^2}{2}\right)^2.$$

Hence substituting these values, we obtain

$$(b - c)^2(c - a)^2 + (c - a)^2(a - b)^2 + (a - b)^2(b - c)^2$$

$$= \left\{\frac{(b - c)^2 + (c - a)^2 + (a - b)^2}{2}\right\}$$

—that is, a perfect square.

Ex. 5. (a) If $a^2 + a + 1 = 0$, show that

$$(x - a)(x^2 - a^2) = x^3 + x + 1.$$

(b) Extract the square root of

$$9\left(x^2 + \frac{1}{x^2}\right) - 12x\left(x^4 + \frac{1}{x^3}\right) + 22x^2. \qquad (1906.)$$

Ex. 6. (a) Show that $2(ab + cd)$ cannot be greater than $a^2 + b^2 + c^2 + d^2$.

(b) In the case of any four consecutive odd numbers show that the product of the second and the third is greater by 8 than the product of the first and last. (1903.)

Ex. 7. (a) If $\frac{a}{b + c} = \frac{b}{c + a}$, show that either

$$a = \pm b, \text{ or } a = m - b. \qquad (1906.)$$

Ex. 8. (a) Extract the square root of

$$x^4 - 2kx^3 + (k^2 + 2)x^2 - 2kx + 1.$$

(b) Extract the cube root of

$$x^6 + 12x^5 - 320x^3 + 3072x - 4096.$$

Ans. (a) $x^2 - kx + 1$; (b) $x^2 + 4x - 16$.

Ex. 9. Extract the square root of

$$\frac{6\sqrt{\frac{3}{2}} - 4\sqrt{\frac{2}{3}}}{5\left(\sqrt{6} + \sqrt{\frac{2}{3}}\right)}. \qquad (1900)$$

Ans. $\pm \frac{1}{5}$.

Ex. 10. Extract the square root of

$$2a + \sqrt{(3a^2 - 2ab - b^2)}. \qquad (1899.)$$

Ans. $\sqrt{\frac{3a + b}{2}} + \sqrt{\frac{a - b}{2}}$.

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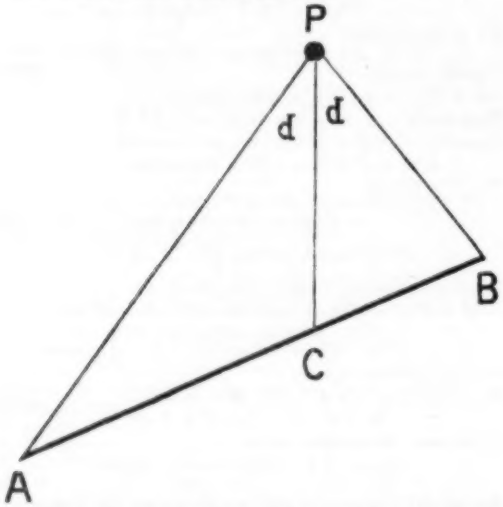
J. A. Watson.—A thin rod is suspended by a fine inextensible string fastened to it at the two ends, and passing over a smooth peg. If the centre of gravity is not at the middle point, find the position and nature of the equilibrium.



Let P be the peg, AB the rod in a position of equilibrium, and C the centre of gravity of the rod. Let m denote the length of AC, n the length of CB, and l the length of the string. The rod is at rest under the action of three forces —namely, the tensions of the string along AP, BP, and the weight of the rod acting in the vertical through C. Since these three forces must pass through the same point, it follows that P must be in the vertical through C. Again, since the peg is smooth, the tensions of the string along AB, BP must be equal to one another. Hence CP must bisect the angle APB. We have therefore

$$AP : PB = AC : CB = m : n.$$

Hence the peg divides the length of the string in the ratio $m : n$. Thus the position of equilibrium is defined.

Further, since $\frac{AC}{CB} = \frac{m}{n}$, we have

$$n \,.\, AC = m CB.$$

Then if P is *any* point outside AB, we have by a deduction from Euclid, Book II. 12, 13,

$$n \,.\, AP^2 + m \,.\, PB^2 = (m + n) \,.\, CP^2 + n \,.\, AC^2 + m \,.\, CB^2.$$

Hence CP is a minimum when $n \,.\, AP^2 + m \,.\, PB^2$ is a minimum. P being the point on the string in contact with the peg, suppose $AP = x$. Then $PB = l - x$, and

$$n \,.\, AP^2 + m \,.\, PB^2 = nx^2 + m(l - x)^2, \ (= u, \text{ suppose}).$$

$$\therefore u = (m + n)x^2 - 2lmx + ml^2.$$

$$\therefore \frac{du}{dx} = 2(m + n)x - 2lm, \text{ and } \frac{d^2u}{dx^2} = 2(m + n).$$

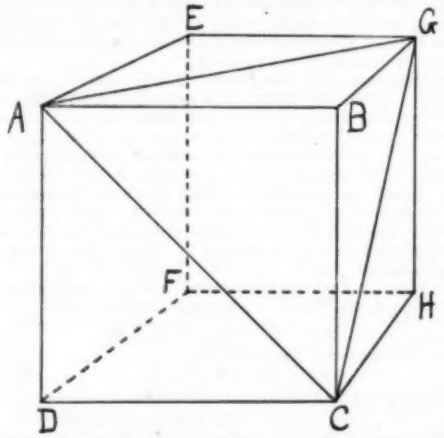
Hence CP is a minimum when $AP = \frac{m}{m + n} \,.\, l$.

But, as we have shown already, this value of AP defines the position of equilibrium. Hence if the system when in the position of equilibrium receives a small displacement in the vertical plane through the rod, the centre of gravity will be lowered. The equilibrium is therefore unstable.

(*Note.*—It is obvious that there are two other positions of equilibrium, in both of which the rod hangs vertically. It is easily seen that each of these is a position of stable equilibrium.)

Bike.—From a corner of a solid cube a tetrahedron, all of whose vertices are vertices of the cube, is removed. Determine the distance of the centre of gravity of the remaining portion from the various faces of the cube.

(Inter. Science, London, 1905.)



Let B, ACG be the tetrahedron. The volume of BACG = (area of triangle ABG × ⅓BC) = ⅓ volume of cube. Hence if the weight of cube be denoted by $6w$, the weight of tetrahedron = w, and the weight of remaining portion = $5w$.

Now in any of the standard text-books on Statics it is proved that the centre of gravity of a tetrahedron coincides with the centre of gravity of four equal particles placed at its vertices. From this it is obvious that if x_1, x_2, x_3, x_4 denote the distances of the vertices of the tetrahedron BACG from any plane, then the distance of the centre of gravity of the tetrahedron from that plane is given by

$$\frac{x_1 + x_2 + x_3 + x_4}{4}$$

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Hence the distance of the centre of gravity of the tetrahedron B, ACG from any one of the three planes ABCD, BCHG, GBAE

$$= \frac{0+0+0+a}{4} = \frac{a}{4},$$

where a is the length of an edge of the cube.

Taking moments about any one of these three planes, we have

$$w \times \frac{a}{4} + 5w \cdot \bar{x} = 6w \cdot \frac{a}{2},$$

where $\bar{x}$ is the distance of the centre of gravity of the remaining portion of the cube from that plane.

$$\text{Hence } 5\bar{x} = 3a - \frac{a}{4}. \quad \therefore \bar{x} = \frac{11}{20}a.$$

The distance of the centre of gravity from any one of the three remaining faces of the cube is obviously

$$a - \frac{11}{20}a = \frac{9}{20}a.$$

Grateful.—A person invests £299 in consols. On the price of £100 consols being increased by £3, 10s. he sells out, making a profit of £11, 7s. 6d. At what price did he buy the consols?

(Cambridge Junior, 1906.)

For a gain of £3½ he must have bought £100 of the stock.

$$\therefore \text{ £1 } \frac{100}{3\frac{1}{2}} \text{ £11½ } \frac{100}{3\frac{1}{2}} \times 11\frac{1}{2}$$

$$\pounds\frac{100}{3\frac{1}{2}} \times 11\tfrac{1}{2} = \pounds\frac{200}{7} \times \frac{91}{8} = \pounds 25 \times 13 = \pounds 325.$$

Hence £325 of the stock cost £299.

$$\therefore \text{ £1 } \pounds\frac{299}{325}.$$

$$\therefore \text{ £100 } \pounds 299 \times \frac{100}{325}.$$

$$\pounds 299 \times \frac{100}{325} = \pounds 92.$$

Therefore he bought the consols at 92.

Noxid.—In finding the radius of a spherical surface by means of a spherometer, the altitude of a spherical segment is read off on a scale, the base of the segment being the circle passing through the three points A, B, C, where the feet of the instrument rest on the sphere. If h be the altitude of the segment, and l the length of each side of the plane triangle ABC, show that the radius of the sphere is $\frac{h}{2} + \frac{l^2}{6h}$.

(Inter. Science, Engineering, London, 1907.)

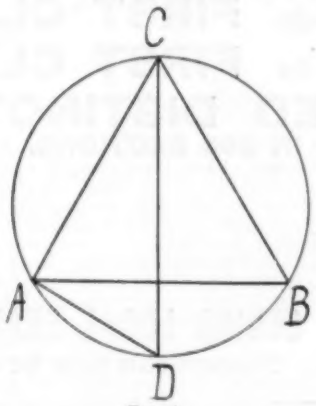

Fig. 1.

Let the circle ABC (Fig. 1) represent the base of the segment. Then, since the triangle ABC is equilateral, the diameter CD will bisect the angle ACB. Join AD. Then the angle DAC = 90°, ACD = 30°, and ADC = 60°.

$$\text{Hence } \frac{CD}{AC} = \frac{\sin 90^\circ}{\sin 60^\circ} = \frac{2}{\sqrt{3}}.$$

$$\therefore CD = \frac{2}{\sqrt{3}} \cdot AC = \frac{2}{\sqrt{3}} \cdot l.$$

In Fig. 2 let EF be the diameter of the sphere which bisects CD in H. Then $EH \cdot HF = CH \cdot HD = \frac{1}{4}CD^2$.

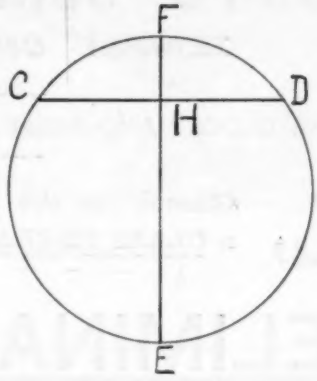

Fig. 2.

But $EH = 2r - h$, and $HF = h$, where r is the radius of the sphere.

$$\therefore (2r-h)h = \tfrac{1}{4}CD^2 = \tfrac{1}{4}\left(\frac{2l}{\sqrt{3}}\right)^2.$$

$$\therefore (2r-h)h = \frac{l^2}{3}.$$

$$\therefore 2r - h = \frac{l^2}{3h}.$$

$$\therefore r = \frac{h}{2} + \frac{l^2}{6h}.$$

H.C.H.—If y equals the sum of two quantities, of which one is constant and the other varies as xy, and if $y = -2\frac{1}{2}$ when $x = 2$, and $y = 1$ when $x = -2$, express y in terms of x.

Let $y = k + mxy$ where k and m are constants. Then by the question we have

$$\left.\begin{aligned} 1 &= k + m(-2)(1) \\ -2\tfrac{1}{2} &= k + m(2)(-2\tfrac{1}{2}) \end{aligned}\right\}.$$

$$\text{Hence } 3\tfrac{1}{2} = . \ -2m + 4\tfrac{1}{2}m.$$

$$\therefore \frac{10}{3} = 2\tfrac{1}{2}m. \quad \therefore m = \frac{5}{4}.$$

Substituting this value of m in the first equation, we have

$$1 = k + \frac{5}{4}(-2).$$

$$\therefore k = 1 + \frac{5}{2} = \frac{7}{2}.$$

Writing $\frac{7}{2}$ for k, and $\frac{5}{4}$ for m in the equation

$$y = k + mxy,$$

we have

$$y = \frac{7}{2} + \frac{5}{4}xy.$$

$$\therefore y\left(1 - \frac{5}{4}x\right) = \frac{7}{2}.$$

$$\therefore y(4 - 5x) = 14.$$

$$\therefore y = \frac{14}{4 - 5x}.$$

THE *Moral Instruction League Quarterly* reports that during the past quarter the Moral Instruction League has sent its *Graduated Syllabus of Moral and Civic Instruction for Secondary Schools* to all the head-masters of such schools and to the chairmen of the governing bodies of these schools. During the quarter the local education authorities of Chester, Swansea, and Swindon have made provision for systematic moral instruction in their schools, the two former having adopted the league's *Graduated Syllabus of Moral and Civic Instruction for Elementary Schools*. Fifty-one local educational authorities now have provision for moral instruction of a more or less systematic kind. The league also reports the progress of the German Moral Instruction League, which has now seven hundred and ninety members, and the formation of what promises to be a very strong league in the United States of America. Both these leagues owe their initiation to the British Moral Instruction League. A further league is in process of formation in Switzerland.

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ré - jou - ir, Pour-vu qu'il vous di - ver - tis - se. La Pa - lisse eut peu de bien, Pour sou-
te - nir sa nais - san - ce, Mais il ne man - qua de rien Dès qu'il fut dans l'a - bon - dan - ce.

2. Bien instruit dès le berceau,
Jamais, tant il fut honnête,
Il ne mettait son chapeau
Qu'il ne se couvrît la tête.
Il était affable et doux,
De l'humeur de feu son père,
Et n'entrait guère en courroux
Si ce n'est dans la colère.

3. Il brillait comme un soleil,
Sa chevelure était blonde;
Il n'eût pas eu son pareil,
S'il eût été seul au monde.
Il eut des talents divers;
Même on assure une chose:
Quand il écrivait en vers,
Il n'écrivait pas en prose.

4. Un devin, pour deux testons,
Lui dit d'une voix hardie,
Qu'il mourrait delà les monts
S'il mourait en Lombardie.
Il y mourut, ce héros,
Personne aujourd'hui n'en doute;
Sitôt qu'il eut les yeux clos,
Aussitôt il ne vit goutte.

5. Il fut, par un triste sort,
Blessé d'une main cruelle.
On croit, puisqu'il en est mort,
Que la plaie était mortelle.
Il mourut le vendredi,
Le dernier jour de son âge;
S'il fût mort le samedi
Il eût vécu davantage.

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(*d*) The influence of climate and geographical position upon a people, as illustrated by the cases of India, England, and Scotland respectively.

Read the chapter on clearness of expression, and observe how the meaning of the following sentences is obscured:—

1. Great Britain imports large quantities of meat from Australia, which is chiefly frozen.
2. Some girls at school make friends, and remain so all their life.
3. The first day at school seems funny to any one not used to going there.
4. A daily walk is essential for every school girl, as if not her lessons become very dull.
5. Most people keep poultry in the country on account of the eggs.
6. Brian the hermit stood by the fire which had been made barefooted and in cap and hood.
7. Hardly had he said this than the man mentioned appeared.

(1.) The adjectival clause "which is chiefly frozen" is set in a wrong position. It seems to qualify Australia; as it is intended to qualify "meat," it should be written immediately after that word.

(2.) There is a confusion here between "making friends" and "becoming friends." If we say that girls "make friends," then we should say, "and retain them all their life" (or for the rest of their lives).

(3.) Apart from the use of "funny" for "strange," the sentence is tautological, for any one who has got used to going to school could not go there for a "first day." "Funny" means full of "fun," and should not be used for "strange." Of course the misuse of the term is easily accounted for. Very frequently the strangeness of a thing is a cause of fun; hence a thing is said to be funny because it is strange, although it may actually be even pathetic.

(4.) The elliptical expression "as if not" is employed quite incorrectly. It really is equivalent to "in the contrary case;" and here it actually states that the girl's lessons become very dull if the daily walk is not essential. The writer evidently meant "if a daily walk is not *taken*."

(5.) The error in this case arises from the position of the phrase "in the country." If it comes after "people," it is an adjectival phrase; most people in the country = most country people, and the statement may be true. But as the statement stands, it is a very long way from the truth, for most people do not keep poultry either in the country or anywhere else.

(6.) This would be improved somewhat by placing a comma after the word made; this would serve to indicate that the phrase "barefooted and in cap and hood" does not apply to "fire." But the best way to bring out the meaning is to write this phrase immediately after "hermit," which it qualifies. It might also be placed after "stood;" but then the sentence loses dignity, as, after all, the phrase is adjectival, and not adverbial.

(7.) The word "than" should be used correlatively to a comparative word. Thus we might say, "No sooner had he said this than—" If no comparative is used, we should substitute "when" for "than."

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of physical training, and we cannot now do more than indicate the dangers that have to be avoided. Above all things, it is necessary to bear continually in mind the object of the training. Physical exercises should aim at developing the body, and such displays as one often sees at prize distributions, although they may pass muster as a means of amusing parents and other visitors, should not be described as "physical training." The teacher should understand the purpose of each movement, and should call it to mind when giving the orders. It is important to avoid excess, as excessive fatigue will quite undo the benefit gained at first by moderate exercise. In the same way, the exercises must be suited to the age and development of the children; an exercise which may be beneficial to a boy or girl of twelve or thirteen may be positively harmful to an infant under seven. Another essential point is to keep the mind alert; a simple exercise such as marching tends to become mechanical, even in such forms as "tip-toe marching" or "angle-step." Hence there is much to be gained by requiring children to mark the third, fourth, or other step. After a time even this tends to become mechanical, and the right step is accented without much attention being paid to it. As soon as this happens a change should be made.

The simple laws of health form very suitable material for object lessons. Every teacher should study the elements of hygiene and physiology. He will then be in a position to teach the *rationale* of diet, and show the function of each of the different classes of foodstuffs, and the proportions and total quantity of each that should be taken. Temperance in all things should be encouraged, and this must be regarded as a training of the will to submission. It is absurd to think that a child is being trained in temperance by an enforced abstinence from alcohol, for which, as a child, he probably has no natural inclination, while he is allowed to glut himself with pastry and sweets. Later on in life he may find wines or spirits suit his taste, and then woe to him if he has not learned self-restraint. Few subjects are of greater importance for the future of the children than temperance, and yet there is perhaps no subject in which the teachers so often allow their zeal to outrun their discretion. How frequently do teachers make use of words and phrases instead of ideas and principles! Thus temperance teachers are continually quoting the injunction, "Touch not, taste not, handle not." Yet this very passage is given by St. Paul as a specimen of those ordinances "which all are to perish with the using," and are to be avoided in teaching (see Col. ii. 20–23).

The study of appropriate clothing leaves much to be desired, both on the score of health and on the score of beauty. The teacher can do much to encourage good physical habits, especially if he co-operates with the parents. Among these we may mention such habits as the use of the correct position in writing. Many children spoil their eyesight and become short-sighted by holding their eyes too close to their work; and such is the force of habit that after they have taken to spectacles to enable them to see things farther off, they continue to put their eyes in the old position, and become more short-sighted still.

Apart from the mischief done to the eyesight, much harm is frequently done to the spinal column, etc., by the adoption of an improper attitude in the writing lesson.

Other "good physical habits" the teacher may do much to establish are habits of cleanliness. Such a habit as that of spitting should be vigorously put down. The importance of regular habits in the matter of rising and going to bed, and in the time of taking food, and the use of the toothbrush should be insisted on. A very useful object lesson can be given on "habit" itself, even by teachers who have made no very special study of psychology.

English Literature.

For general reading take a short selection of the anthology of verse every day. If only one sonnet be read and thought over each day, much benefit will be derived. It is quite useless to leave a collection of poetry to be prepared at the end. Read also Shakespeare's *Macbeth* this month.

For detailed study finish the second book of *Paradise Lost*.

960. *Chaos*, the confused state of matter in the universe. When order was established it became *cosmos*.

964. *Orcus and Ades.* Milton seems to regard these as two distinct deities, but the Roman poets use the term Orcus as synonymous with Ades or Hades, the god of the lower region, brother to Jupiter and Neptune.

964. Notice the figure of speech—metonymy. It was not the name that stood, but Demogorgon of the dreaded name.

977. *Confine.* This is a very unusual use of the verb, but it is perfectly literal—to have their boundaries together. Latin *con*, with; and *finis*, an end or boundary.

988. *Anarch*—that is, Chaos, the one who had no rule. Compare *anarchy*.

995. *Confusion worse confounded.* Notice the great strength of this phrase, which is frequently quoted.

1016. *Wins his way*, contests his way, strives for his way. The original meaning of "to win" was "to struggle." The change of meaning surely teaches us that if we struggle faithfully enough we shall gain our point.

1017. *Argo.* The *Argo* was the fifty-oared ship built by Argus, in which Jason and his companions sailed to Colchis in search of the golden fleece.

1018. *Bosporus* has the same meaning as Oxford—the ford or passage of the ox. It is another name for the Strait of Constantinople.

1019. *Ulysses on the larboard shunned Charybdis.* Ulysses was one of the chief heroes that fought against Troy. After the capture of the town he and some Greek companions went through a series of wanderings and adventures, among which was the passage through the Strait of Messina, in which Ulysses lost six of his companions, who were devoured by the monster Scylla. Charybdis was the name of a rock on one side of the strait. *Larboard*, the left-hand side of the ship looking forward. It is now generally called the port side, to avoid possible confusion with "starboard."

English History.

At the time of the declaration of the French Republic the Convention was under a great disadvantage, owing to its own internal divisions. There were three great parties—the *Girondins*, the *Montagnards*, and the *Plaine*, each of which acquired chief power in turn. The Girondins relied on the middle classes, and distrusted the common people, and wished to keep down the Paris mob, which had made its influence too strongly felt. The Girondins soon quarrelled with the Montagnards, and accused their chiefs—Marat, Danton, and Robespierre—of causing the September massacres; but they could not support their charges, and in return the Montagnards determined to force the Girondins to bring Louis the Sixteenth to trial. His trial began on December 11, 1792, and he was executed on January 21, 1793.

The death of the king caused his supporters to become bitter opponents to the Convention, and led to a coalition of the powers against France. After having checked the Duke of Brunswick at Valmy, Dumouriez drove back the enemy to Mayence, and then turned against the Austrians in the Netherlands, where the new French troops gained a brilliant victory at Jemappes, which made them masters of Belgium as far as the Meuse. Shortly afterwards the French invaded Holland, but were defeated at Neerwinden (March 18, 1793).

It was the attack on the Dutch, who were our allies, that led Pitt to join in the coalition against France. Pitt's policy was essentially a peace policy, and he considered that the French were fully entitled to settle what form of government they should have for themselves; but when they came to attempt to impose the republican form on the Netherlands by force of arms, he was bound by treaty to join in the war against France. But the Convention had to deal not only with foreign armies, but with a very formidable insurrection that broke out in the west—La Vendée.

The Girondins, finding themselves unequal to the struggle, handed over the reins to the Montagnards. When the latter came into power the fortunes of France were at a very low ebb. The British and Dutch were besieging Dunkirk; the Austrians had taken Condé and Valenciennes, and were preparing to advance on Paris; the Prussians were besieging Mayence, which they took, in spite of the heroic defence by Kléber; another Austrian army was invading Alsace; while the Spaniards were invading the Eastern Pyrenees. Forty-seven departments were in arms against the government; the royalists were masters of Lyons, and had invited the British fleet to enter Toulon to help them. The Vendeans had gained several victories over the republican troops, and were threatening Nantes, the capture of which would have enabled them to join the insurgents in Brittany.

These difficulties will explain the harsh measures that were used in breaking down opposition, and which brought upon the government the name of the "Terror." The executive government consisted of a "Committee of Public Safety," which had practically absolute powers. Among the chief members were Saint-Just, Couthon, Robespierre, Barère, and Carnot. The last was called the "Organiser of Victory," from the success which attended his efforts to reform the army. He raised men from the ranks to chief command, and supplied great numbers of men to overwhelm opposition. Houchard relieved Dunkirk, and Jourdan defeated the Austrians at Wattignies, and barred the road to Paris. In the east Lazare Hoche cleared the Austrians and Prussians from Alsace, and took up his winter quarters in the enemy's country. Thus by the end of the year France was entirely free from invaders, except for small parties of Spaniards in the south.

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The same rigorous means were adopted against the royalists. Lyons was captured after sixty-three days' siege, but Toulon resisted until December. In the latter siege Napoleon Bonaparte first distinguished himself, being then a captain in the artillery. The Vendeans failed in their attack on Nantes, and after a time were attacked by four columns under Kléber, and routed. They endeavoured to unite in the north and take Granville, which would have put them in communication with the English fleet; but they were unsuccessful, and at last, after a long guerilla struggle, were completely subdued.

In 1794 the French gained the victories of Mouscron and Turcoing, near Lille; and then Jourdan crossed the Sambre, captured Charleroy, and gained the great battle of Fleurus. This made the French masters of Belgium for the second time.

But although the Montagnards saved France, they soon ruined their party by internal dissensions. First Hébert and his friends made an attack on Christianity, and endeavoured to set up a worship of reason. Robespierre accused them of atheism, and the leaders were beheaded. Next Danton and Camille Desmoulins, wishing to restrain the wholesale executions, were accused of Orleanism, and executed without trial. Then Robespierre, with his friends Saint-Just and Couthon, secured the chief power. Robespierre instituted the "Feast of the Supreme Being" on June 8, and seemed in the height of power; but he soon began to annul the remaining guarantees of liberty, and his friends, apprehensive of their safety, deserted him and joined the Plaine. This led to his downfall, and he was executed July 27, 1794.

The Convention soon after this drew up a new constitution, providing that the legislative power should be vested in an Assembly of two houses—the lower called the Council of the Five Hundred, and the upper one the Council of the Elders; while the executive power was to be put in the hands of a *Directory* of five members chosen by the Legislative Assembly.

The Convention was then dissolved. We are apt to regard its three years of government too much in the light of the horrible doings of the Reign of Terror, without considering the grave conditions which are in some measure an excuse for them, and without giving it credit for valuable administrative work. While saving France from foreign enemies and putting down rebellion at home, it worked out the problem of a system of public education, simplified the laws and customs, and introduced the rational metric system of weights and measures. We trust that most of our readers are sufficiently advanced in French to read *Le Directoire* by Madame de Stael, which gives a clear and interesting account of the next stage of the great movement.

After Lord Howe's victory off Ushant (the "glorious First of June"), the British fleet had steadily kept up a blockade of French ports, which was more or less effective. The French, however, made two indirect attacks in the form of expeditions to Ireland. These both failed, although one was commanded by no less a general than Hoche, who afterwards went to the Rhine district, and repaired the losses that had been sustained under Jourdan and Marceau by his brilliant campaign of 1797.

Bonaparte crossed the Alps and made himself master of Lombardy in 1796, gaining the battles of Mondovi and Lodi. He then established himself at Mantua, and defeated in turn four armies sent against him by the Austrians in the famous battles of Castiglione, Arcola, and Rivoli. He then marched northward, came in sight of Vienna, and signed the preliminaries of Leoben, which were ratified by the Treaty of Campo-Formio.

After this Bonaparte continually watched for opportunities to increase his political power. The Directory wanted him to undertake the invasion of Great Britain; but he saw that things were not ready for such an undertaking, so he urged an indirect attack by striking a blow at India through Egypt. He left Toulon with 35,000 chosen soldiers in May 1798, and managed to evade Nelson, who, however, discovered the French fleet in the Bay of Aboukir and destroyed it, thus shutting the French army in Egypt. Bonaparte defeated the Mamelukes at the Battle of the Pyramids, and the next year invaded Syria. The geographical features of the country compelled the French to keep near the coast, and on reaching Acre they found the town so well fortified that they were unable to capture it, but had to return to Egypt. There Bonaparte defeated at Aboukir a Turkish army that had been landed by the British fleet; but as he saw an opening for his personal ambitions in France, he left Kléber in command in Egypt and hurried back to Paris.

By their interference with the government of the neighbouring small states the Directory had stirred up the Powers to a second coalition, which at first drove the French armies from the advantageous positions they occupied; but afterwards fortune changed in favour of the French, who gained a series of victories culminating in that of Zurich, in which, under Masséna, they defeated the Russians under Souwarow, and compelled the latter to withdraw from the coalition. But these victories could not save the Directory, which was overthrown, and a Consulate established, which put the chief power in the hands of Bonaparte. France now had to struggle against Austria on land and Great Britain on sea. The former, after the disasters of Marengo and Hohenlinden, withdrew from the coalition; but the latter struggled on, and captured Malta and compelled the French to evacuate Egypt. Bonaparte tried to meet the maritime power of Great Britain by forming the "League of Neutrals;" but after the bombardment of Copenhagen by Parker and Nelson the league was broken up. Bonaparte prepared a flotilla at Boulogne for the invasion of England, but Nelson kept it closely blocked in the port. As there seemed no likelihood of fighting the matter out, both parties agreed to a peace, which was signed at Amiens (March 1802). This marks the close of the first part of the struggle, and the part which is perhaps the most difficult to follow out.

Geography.

Finish the physical geography of North America.

Arithmetic.

Study the chapters dealing with the working of problems. Of course no definite rule can be given for dealing with them, but the general principles are set out; and should the student find any special difficulties, we will gladly deal with them if they are sent up.

Algebra.

The chapter on problems involving quadratics appropriately comes in with the chapter on problems in arithmetic, and in the Certificate Examination algebraical methods are accepted in the arithmetic paper; and as in the case of arithmetic, we shall be pleased to deal with any difficulties that are sent up.

Geometry.

The following problems must be practised, and the principles on which they are based thoroughly understood.

1. To construct a segment of a circle containing an angle equal to a given angle. (See Euclid III., 33.)

2. To divide a given straight line into parts which bear a given ratio. This depends upon the fact that a straight line drawn parallel to the base of a triangle forms with the segments of the sides a triangle which is similar to the original triangle, or, in other words, it divides the sides into segments which are proportional (Euclid VI., 2).

Consequently, if the given divided line and the line which has to be divided be made to form two sides of a triangle, the base being formed by a straight line joining their extremities, then straight lines drawn through the given points of division in the one line parallel to this base will cut the other given line proportionally.

Another way of working this problem is to put the two lines parallel to one another, and join their extremities by straight lines which are produced till they meet. If the given lines are equal, then the lines joining their extremities will not meet, since they are parallel. In this case the problem is worked by simple transference. But if the lines meet at a point, then the straight lines joining this point with the points in the given line will divide the other proportionally. This may be proved by showing that these segments bear the same ratio to the segments of the common sides of the triangles formed.

3. Construct a fourth proportional to three given straight lines. This is based on Euclid VI., 2, but is given as a problem in Euclid VI., 12.

4. To find a third proportional to two given straight lines. This is really only a particular case of the preceding, and can be worked by the same method, using the second line twice.

5. To find a mean proportional between two given straight lines (see Euclid VI., 13). This is, however, only a new way of stating Euclid II., 14, if we regard the two given lines as the sides of a given rectangle.

Elementary Science.

Study the section on "rocks, limestone, chalk, sandstone, sand, clay, coal, slate, iron ore, salt; fossils and their meaning; study of local conformation and local surface geology."

The student must be careful to distinguish between rocks and minerals. Minerals are substances having a definite (or nearly definite) chemical composition, such as quartz, which is a chemical substance known as silica, SiO_2; there may be slight impurities in it, as in the case of smoky quartz, which is coloured with carbon, and amethyst quartz, which is coloured with manganese. Minerals are comparatively few in number, but they are generally associated with others in great variety, and form rocks.

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The first rock given in our list is limestone, which is composed of the mineral carbonate of calcium, $CaCO_3$, the same as chalk; but it is harder and coarser than chalk. Some kinds of limestone are very coarse in the grain, and one is actually called "oölite" (from Greek *oon*, an egg), because it resembles the hard roe of fishes. Chalk and limestone bear evidence in most cases that they have been formed under the sea, for they contain the fossil remains of sea-shells; and chalk in particular is composed almost entirely of the remains of microscopic marine creatures. Chalk that has been buried for a long time becomes hard, and in some cases passes gradually into beds of marble, which has the same chemical composition, but owing to the action of heat and pressure has acquired a crystalline structure.

Sand is composed of small particles of silica; in some cases it is very pure, and is known as silver sand. Such sand is used in glass-making. Generally, however, sand is coloured yellow or red, owing to the presence of oxide of iron. Water very easily soaks through a bed of sand, but solid matter is left behind. In this way a bed of sand may act as a natural filter. It frequently happens that water which contains some chemical substance such as lime may soak into a bed of sand and convert it into a hard rock. In this way sandstone has been formed.

Clay consists of particles of felspar or silicate of alumina, and is generally formed by the breaking up of rocks of felspar, or of granite, which contains felspar. When pure it is white, and is called kaolin or china clay, and is used in the manufacture of pottery; but it is generally coloured yellow or brown owing to the presence of iron, which causes the red colour in tiles and flower-pots after they have been burnt.

Slate is a hardened form of clay; it easily cleaves into sheets, which makes it useful for roofing.

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THE spontaneous outbreak of risings against law and order by the peasants of England towards the end of the fourteenth century is sufficiently at variance with the usual respect for authority shown in English history, that it is worthy of a somewhat more detailed examination than is usually given in text-books. The cause is too often set down by the superficial student as the insult offered to Wat Tyler's daughter, as though hundreds and thousands of peasants would have risked life and limb to avenge an incident only too common in a rude and ignorant age. The causes lie far deeper, the grievances were of longer standing and of more serious aspect, than a mere fracas with a tax-collector.

The root lies in the changes produced by the Norman Conquest. The Saxon yeoman and churl, accustomed to freedom of life and speech, could ill brook the position into which they were forced; for they became serfs or villeins to the Norman lords to whom estates on which they lived were granted, and as such lost what was most precious to them. It is always difficult to realise conditions of past history. One is always tempted to assume that they were substantially as at present; whereas the life of a peasant now is infinitely superior to anything that existed in the dark ages. The villein was completely at the mercy of his lord, and was regarded by him as a mere animal. As such, he was to some extent protected; but he might neither leave the manor, nor marry, nor sell the scant produce of his labour, without his lord's consent. His house was the most miserable hut; the furniture consisted of a few wooden seats, table, and utensils; his bed was a heap of straw, his clothes the roughest cloth, or frequently leather, his food coarse bread and salt pork, his drink mead and ale, and his whole life a continual struggle against hunger. The long winter evenings were generally spent in darkness, or in darkness made visible by the light of a rush which had been dipped in tallow or fat of some kind. The only amusements which came his way were the meetings with his fellows on Sunday or a holiday, the visit of some strolling minstrel or juggler or bearward, or perhaps a travelling packman. His outlook was hopeless; there was no chance of ameliorating his position except by the escaping to a chartered town and residing within its walls for a year and a day, when he became free. But this was a step of such momentous difficulty that it was rarely done.

Each villein held a piece of land called a *virgate*, the size of which differed in different parts and on different estates. For three days a week in the summer and two in the winter he had, in return for the privilege of working his own land, to till the lands of his lord; and the latter demanded the services not only of the man, but of all his family, excepting the housewife. There was no science of agriculture; the implements used were the roughest, and the only rotation of crops was to let the land lie idle each third year. Thus one-third was laid down for wheat, one-third for oats or barley, and one-third was fallow. A few vegetables were cultivated in the garden, and perhaps a cow or two were kept, which grazed on the common lands. To make the scantiest living necessarily meant hard toil, from sunrise to sunset, day after day. The wheat, if not ground at home, had to be ground in the lord's mill, and the miller was a man of some importance, who was generally accused of keeping more than his fair share of the meal. If by chance a villein produced more than was necessary to supply his own needs, and wished to sell the surplus at one of the markets or fairs, the dues demanded of him for the privilege usually absorbed nearly all the profits. Altogether, it was a hopeless, dreary life, which gave no opportunity for self-advance or improvement. Supposing a villein did become free and resort to a town, it was extremely difficult to find remunerative work. Most of the trades were organised, and entry was impossible except after a long apprenticeship and the approval of the Trade Guild. The long wars with France produced another contributory cause. The lords, in order to make up the number of their retainers, gave freedom to villeins, who accompanied them; and these returned (sometimes) with a wider view of life and with a strong disinclination to resume their former humdrum existence after the life of pillage and excess they had lived abroad. But as they had to live, they hired themselves as farm-labourers.

The fetters of villenage had somewhat relaxed when, in 1361, the Black Death swept over the land. This was a form of cholera which had undoubtedly been introduced from the East, and which continued to visit England down till last century. On its first visit it reduced the population by about one-half (the population was between three and five millions), the insanitary conditions which everywhere prevailed materially assisting its progress. The result was that, as the number of labourers available for hiring was greatly reduced, the rate of wages demanded was nearly doubled. Villenage was revived and strictly enforced, and the Parliament attempted, by the various Statutes of Labourers, to fix the price of labour, greatly to the disgust of the labourers, who organised themselves to resist this new encroachment on their liberty.

Another cause was the teaching of the followers of Wycliffe. Wycliffe was an earnest reformer, who, disgusted with the laziness and corruption in the Church, attempted to remove some of the abuses and to bring its teaching directly to the poor and suffering. His followers, "Wycliffe's Poor Preachers," went everywhere through the land preaching, and arousing men to a sense of their condition. They added to their master's lessons a vague socialism, and formed a ready means of communication between one part of the country and another. John Ball was especially conspicuous with his rhyme—

> "When Adam delved and Eve span,
> Who was then the gentleman?"

The disastrous course of the French war at the end of Edward the Third's and the commencement of Richard the Second's reign added to the general discontent, for the national pride was touched at losing what had cost so many lives and so much money to acquire, and the discontent was rendered still deeper by the heavy and unjust taxation. Poll taxes on all over fourteen years of age were levied in 1377, 1379, and again in 1380. The third tax, graduated from sixty groats to one per head, proved a heavy sum to pay when it is considered that it represented several days' wages. The climax was reached when the collection of the tax was farmed out to collectors, who acted with great brutality and harshness. The whole country was seething with hardly-repressed excitement, and it needed only a spark to fire the mine. This was provided by the incident of Tyler's killing a collector at Dartford. His fellow-townsmen stood by him; the news spread rapidly throughout Kent, and northward as far as the Humber; and the villeins determined to make a violent effort to shake off the shackles which had bound them for centuries. Court-houses were sacked and lawyers killed in order to destroy the records of those who were serfs, and London lay at their mercy.

The grievances are summarised by the demands—very moderate—which they made: (1) Abolition of villenage; (2) liberty to buy and sell untolled in fairs and markets; (3) the rent of land to be fixed at fourpence an acre; (4) a general pardon. It was a demand for a new order of things, the substitution of money payment or rent in place of personal service. The fixing of the rental at fourpence an acre was obviously ill-advised, as land

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varies much in quality. Yet it is interesting to note that the average fair price was that amount; it is now 10s. to £3, so much has the value of money decreased.

The king's meeting with Tyler, the latter's death, the king's promises, are well known; but the latter were not kept. In Kent, Suffolk, Norfolk, Cambridgeshire, Huntingdon, and other parts, those who had taken part in the rising were punished with great brutality, over seven thousand losing their lives; and the movement ended in apparent failure.

It is usually the fate of those who head any movement against the constituted order of things to suffer in their lifetime and to die before their dreams are accomplished; and so it was with these poor peasants. But the revolt had not been in vain. The nobility had learned, to their great surprise, that these villeins, hitherto considered as a negligible factor in society, could not be neglected. The custom of letting lands for a money payment soon became common, the excessive tolls in markets and fairs were reduced, and in less than a hundred years villenage had completely disappeared from England, and another great step forward had been taken.

It is interesting to note, in connection with this movement in England, that a similar one occurred in France, where the ravages of the English army drove the people to desperation. The Jacquerie (so called from the nickname for a peasant—Jacques Bonhomme) aimed practically at the same general object as the English rising—namely, the amelioration of the lot of the serf; but it was suppressed and totally stamped out, the embers smouldering through centuries till the great French Revolution.

ESSAYS AND ESSAY WRITING.

The essays submitted during the month are, on the whole, an improvement on previous months, the most apparent defect being the lack of arrangement of thought. It is given to very few persons that their ideas should come in logical sequence, rendering subsequent rearrangement unnecessary, and certainly the student should assume that his thoughts require classification and sorting under suitable heads.

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Subjects for the Month.

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(*a*) Remedies oft within us lie which we ascribe to Heaven.
(*b*) Competitive examinations: should they be abolished?
(*c*) The value of public parks in great cities.
(*d*) The study of natural history.
(*e*) The women of Shakespeare: which do you prefer, and why?
(*f*) Just laws harshly administered are often most unjust.
(*g*) Empire and duty.

The following notes may be of assistance, but the suggestions should not be slavishly followed. They merely indicate one or two lines of thought which naturally suggest themselves:—

(*a*) This is only another way of stating that a man's condition depends much more upon himself than on outside circumstances. "Of all the ills that human flesh endures, small is the part that laws can cause or cure." A man may look with longing to some extraordinary event to make him rich, while he is lazy, improvident, and non-energetic; his wish is hardly likely to be fulfilled. A man may long for health, while he is continually following a course of life which absolutely prevents it; or he may envy another's superior position in trade or profession, yet never seek by study or self-sacrifice to qualify himself for such a post. This is a mistake made by many Socialists, who imagine that by suitable laws every one may be happy and contented, whereas the improvement must come from within.

(*b*) As long as there are more candidates for appointment to any position than there are vacancies there must necessarily be some method of selection. Whether competitive examinations form the best means of identifying the most suitable applicant is a much debated point. It is well known that a candidate may do excellent papers in the various subjects of any curriculum, and yet be entirely destitute of business ability, and ultimately prove a failure in any position of trust. The fact is that character is of more importance than book knowledge; but it is impossible to examine in this particular, and testimonials from those who have had ample opportunity of judging are frequently so unreliable as to be utterly useless. Although it is easy to prove a case against these examinations, it is by no means easy to suggest a satisfactory alternative.

(*c*) "God made the country, and man made the town," Cowper says, and certainly there is a beauty in any diversified country scene which is unapproached by the most elaborate buildings of man's design. Surroundings have a powerful influence on character, and it is futile to expect the denizen of some foul, overcrowded, poverty-stricken slum, where the only prospect is bricks and mortar, to be healthy, bright, wide-minded, and appreciative of the beautiful. Contact with nature should always exercise a beneficial influence over man, and the preservation in the midst of a city of a small sample of natural scenery is helpful not only on mental but on hygienic grounds.

(*d*) Little need be said on this. Apart from the fascination, the practical utility, the educative effects to be derived from the study, there is a refining, sobering, and humbling influence which is wholly good.

(*e*) One of the proofs of Shakespeare's genius is his power of characterisation. Among all the crowd of figures and faces that pass before us as we think over the plays, there are no two alike. Each is as distinct and different as one's acquaintances of to-day, and hence the student has a wide field for selection, for so many are really lovable and charming. The tender and innocent Miranda; the bright, happy, and jolly Rosalind, not the least bit mannish in spite of her costume; the shyer and quieter Celia; the charming Viola; the dark-eyed Jessica; the learned Portia, etc., are all characters worthy of admiration and respect.

(*f*) To ensure security of life and property there must be laws, the breaking of which entails a certain punishment. But as laws are made for all, and as individual characters and circumstances are so exceedingly diverse, it cannot but happen that what might be a just and equitable punishment for an offence in one case may be really unjust for the same offence in another. A man may steal a five-pound note; he may be a hardened criminal, too lazy and vicious to work, who deliberately plans and executes the robbery, and who has no compunction for his act. Another may be little more than a lad, subjected to sudden and great temptation, acting under some motive to assist others, who is subject to all the pangs of remorse for his act. The same punishment to both would hardly be fair. Justice must be tempered with mercy; not only the crime itself, but all the circumstances connected with it, must be taken into account in assessing the debt to be paid to the community.

(*g*) There have been many great empires — though none so large as the British Empire—but they have all crumbled away. Assyrian, Persian, Grecian, Roman, Mohammedan, Indian, Spanish, etc., have grown—and fallen. The causes in each case, if examined, were that the ruling power did not act with strict justice to the ruled. Empires based on injustice are bound to decay, and the first sign is the deterioration in the ruling power. Of the duty the burden of Empire lays on us nothing need be said—it is so palpable and apparent; but it is a matter for very serious consideration as to whether we are *doing* our duty to the Empire, and whether or not the corruption of greed and wealth is not commencing to attack the heart of the Empire. This is a subject which needs most careful thought and attention.

A small book prize will be given for the best essay submitted on either of the above topics. The essays should be about forty to fifty lines long, written on foolscap on one side only. A stamped addressed envelope, if the essay is to be returned, and the coupon of the present issue should be sent with it to Mr. Arthur T. Flux, The Elms, Coleraine Road, Blackheath, London, S.E.

General Intelligence Papers.

Of the many answers submitted, that of Miss D. Wellington, Horton Vicarage, Wimborne, Dorset, has been awarded full marks (50), and the prize forwarded to her. Other very good sets of answers were those by Stuart King (49); W. Groves and R. Mead (48); B. Keating, K. Wilkins, F. M. Horne (47); B. Milburn (46); J. Hineson and L. Kay (43).

In explaining phrases care should be taken to give an exact equivalent in meaning. For example, *carte blanche* does not mean "a white sheet of paper." Several students confused a "mixed metaphor" with a number of separate metaphors.

Questions for the Month.

Papers will be marked and returned, and a prize awarded. Send to address above.

1. What associations gather round the following:—Woodstock, Surat, Lombard Street, Clarendon Code, Warren Hastings, River Niger, Pittsburg, Londonderry, Khartum, Dictum of Kenilworth?

2. In what works do the following characters occur:—Roger Wildrake, Sarah Gamp, Elaine, Brutus, Amy Robsart, Touchstone, Micawber, Carlo Donati, Torfrida, Gurth, Jeanie Deans, Sir Percy Shafton, Salvation Yeo, William de la Marck.

3. By whom and on what occasions were the following words said:—

(1.) Thy necessity is greater than mine.

(2.) They are ringing the bells now; they will soon be wringing their hands.

(3.) Remember!

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(4.) Thank God, I have done my duty.
(5.) Take away that bauble.
(6.) I know that I can save England.
(7.) Let us finish our game first.
(8.) What I have written I have written.

4. Where are Fashoda, "White House," burial-place of Mohammed, Bhamo, Albany, Potosi, Bodleian Library, Sphinx, Lion's Head?

5. Why are the front wheels of an engine smaller than the hind wheels? What is the "rule of the road"? Why does a walking stick whirled round in the hand make a humming noise? Why does the water rush out of a soda syphon?

Lessons in English Language and Literature.—I.

As the English race owes its virility to the various peoples from which it has been compounded, so the English tongue, spoken over a great part of the civilised world, and likely to become the predominant speech on the earth, is indebted for its rich vocabulary not only to the Teutonic stock from which it originated, but to every nation with whom we have come in contact. The study of a language is as interesting as the study of the history of the people. A language is a growing thing which refuses to be bound down by rules which grammarians may choose to make, and presents as many interesting curiosities to the philologist as the realm of nature does to the scientist. A striking characteristic both of the race and of the language is the great power of assimilation to itself of foreign elements. Thus Kitchener, after the battle of Omdurman, selects the best of his prisoners, to the number of some thousands, and drafts them into his army, to assist the force they had been strenuously opposing. In the same way we appropriate useful words from other languages and make them our own, and every little war in which we engage adds to the store. Veldt, kopje, laager, zareeba, chauffeur, etc., formerly unknown, are now familiar in our mouths as household words. Certainly we take liberties with the meaning, and often use the word away from its original sense; but it is an addition to the vocabulary, and adds to the power of expression.

The student should endeavour to regard the language as something worth study. Many, if not all, of the difficulties of grammar disappear when they are traced back to their etymological source, and many expressions which on the face are meaningless become full of signification regarded in this way. Take the common exclamation, "How do you do?" Apparently it means nothing literally, although we use it in the general sense of "How are matters in general, and your health in particular, progressing?" But if we consider the source and meaning of the second "do," and know that it comes from the Anglo-Saxon *dugan* = to thrive, the question at once is, "How do you thrive?" and is full of force. A good etymological dictionary should always be at hand to trace any word which appears to be used in a peculiar sense. What are frequently regarded as mistakes in grammar are very often historical curiosities, and etymologically correct. In Wessex a boy will say to another, "Who bist thee?" (Who art thou?). He is merely using a part of the verb *to be*, which, except in dialect, has been supplanted by *art*, not derived from the verb *to be* at all. Or a girl will say, on hearing some one call, "Her beant a-calling we; us don't belong to she," with a fine disregard for cases; but *beant* for *be not* is legitimate, and *a-calling* is historically correct. Compare I go *a-fishing*. Similarly many of our slang phrases owe their origin in some way to other languages. For example, Tommy (in the sense of food) must have some connection with *tom*, in Hebrew, meaning victuals, and *taam*, in Arabic, meaning food, and the Greek *thomos*, meaning corn; *nobby* is derived from noble; *bosh* is a Hebrew word meaning anything foolish, absurd, disagreeable, nasty, or low; *navvy* has nothing to do with the navy or navigation—*navare operam* is Latin for the very thing a navvy does, which is to undertake a job; *Dear me!* is not a piece of self-praise or appreciation, but probably the twisted form of *O dea mea* (O my goddess), a form of invocation of the Virgin Mary; and the man who says *By Jove!* is usually unaware that he is taking an oath in the name of Jupiter, the king of the gods.

It would be possible to multiply instances indefinitely of such corruptions. By continual use they become stereotyped and fixed in the language. Dialectic peculiarities are also an interesting study. Words wander so far from their spelling and pronunciation that they are unrecognisable. At some assizes in the west some years ago repeated calls were made for a juryman named "Nathaniel Onion." No response was forthcoming, till a juryman suggested that he could probably call him better than the usher. The judge assenting, the man shouted out, "Tat Inon, whar b'ye?" and the answer, "Here I be," came at once from a man standing near.

Our "mother tongue" would always be an interesting study were classes not frightened and confused by the complexities of grammar. "English" is often synonymous with dry-as-dust parsing and analysis. With importations from many sources we necessarily have many synonyms, or words which once meant the same thing, although we now attach different shades of meaning to them; and this is a source of great difficulty to the foreigner in his attempts to learn English. "I like your tongue, miss," said a German—"it is so strong and lovely." Consider the difficulties of the little word *get* to a Frenchman. We *get up* (arise or mount), *get on* (proceed or be successful), *get down* (dismount or alight), *get in* (enter or secure admission), *get up* (organise or arrange), *get through* (complete), *get by* (pass), *get* tired, *get* a cold, *get* a book, *get* a shock, etc.

It is proposed briefly to trace, in a few papers, the growth and development of the language, and account for some of these peculiarities.

To begin at the beginning, the language spoken in these islands at the time when they first appear in profane history was Celtic—of the same family as Welsh, Gaelic, Erse, and Armoric. The Roman occupation introduced many words from the Latin—Latin of the First Period; but as the traces of the Roman occupation were swept away by the Saxon Conquest, so were all the Latin words, except about ten, which remain in names which were adopted by the Saxons to identify places: as *castra*, a camp—in Chester, Manchester; *colonia*, a military colony—in Lincoln; *fossa*, a trench—in Fossway; *portus*, a harbour—in Portsmouth; *strata*, a paved way—in Stratford; *vallum*, a wall—in Wallsend. The Britons driven into Wales and Strathclyde preserved their languages there, but throughout the centre, south, and east the Celtic language was swept away, and the only words remaining are such as *cabin*, *clout*, *crockery*, *darn*, *gown*, *hem*, *mop*, *pan*—words, it will be noticed, connected with a woman's work, and indicating that some of the Saxons found themselves wives from amongst the British maidens, and adopted their terms for common household goods.

The newcomers were tribes of German-speaking peoples, using a low German dialect cognate with Dutch, Frisian, etc. The leading tribes were the Angles and Saxons, and their speech is known as Anglo-Saxon. There were variations in their dialects, which account for the difference between English as spoken in Yorkshire and in Wessex. The Anglo-Saxon language was characterised by the following: (1) It was a fairly pure language—that is, it contained very few words taken from outside sources; (2) it was a synthetic language, highly inflected, and capable of forming new words by addition of prefixes and suffixes, and also by compounding two or more words. Thus *giefu*, a gift, was inflected thus:—

	Singular.	*Plural.*
Nom.	giefu	giefa
Acc.	giefe	giefa
Dat.	giefe	giefum
Gen.	giefe	giefena

and the adjective *ewic* (quick = alive):—

	Singular.			*Plural.*		
	Mas.	*Neut.*	*Fem.*	*Mas.*	*Neut.*	*Fem.*
Nom.	ewic	ewic	ewicu	ewice	ewicu	ewice
Acc.	ewicne	ewic	ewice			
Dat.	ewicum	ewicum	ewicre		ewicum	
Gen.	ewices	ewices	ewicre		ewicra	
Instr.	ewice	ewice	ewicre			

The following example will serve for comparison with modern English. It is taken from the Saxon version of the Bible—Matt. xviii. 12-14. "Gif hwelc man hæfth hund sceapa and him losath an of thæm hu, ne forlætt he tha nigon and hund-nigontig on thæm muntum, and gæth and seeth thæt an the forwearth? And gif hit gelimpth thæt he hit fint, sothlice ic eow secge thæt he swithor ge blissath for thæm ánum thonne for thæm nigon and hund nigontigum the na ne losodon."

Before the Norman Conquest the language had received two important additions. The introduction of Christianity and the connection of the English Church with that of Rome led to the adoption of many words of Latin origin—Latin of the Second Period. As might be expected, these words are connected mainly with Church matters—altar, chapter, bishop, apostle, mass, martyr, etc.—or with the garden (for monks were good gardeners, and introduced many new plants and their names)—for example, cherry, cucumber, peach, pear, etc. The other addition was due to the Danish invasions and settlement in the north and east of England. As the Danes were of the same Teutonic stock, it is not easy to distinguish the words introduced, but the following are undoubtedly Danish: *Beck*, a brook; *by*, a town (there are over six hundred places north of the Thames whose names end in -by, and only one south of it); *ey*, an island; *kirk*, a church; *thorpe*, a village.

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